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Please address all correspondence about articles, abstracts, subscriptions and exchanges to: The Editor, Battelle Technical Review, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio.

The Essence of Research

Good research depends upon good information. Such information is a basic requirement. Modern technology, therefore, dictates that every successful research organization have a smoothly functioning information center. Only such a center can cope with the tremendous volume of books, papers, treatises, and technical articles available to the technologist or engineer. It is impossible for him to read or even review the mass of potentially useful literature. Through the services of a properly operated information center, however, the situation is much improved. I have often observed that the quality of research reflects, to a surprising degree, the quality and extent of the information available to the research worker.

The Battelle Technical Review (formerly the Battelle Library Review) had its beginning more than fifteen years ago when Battelle first issued mimeographed listings of current technical articles. They were intended solely to transmit information to the Battelle staff, which then numbered less than one hundred people.

By January, 1944, it had outgrown the listing stage and had become an abstract journal. The demand for information about the articles had led to abstracting of their contents and the establishment of a full-time abstracting staff. At present, articles from eight hundred and fifty periodicals from all parts of the world are abstracted. We are now making this abstract journal available to all who feel they may benefit from it.

In addition to the abstract section, the new Review will carry research news and original articles. We hope you like it.

CLYDE WILLIAMS

Director, Battelle Memorial Institute

RECENT PAPERS BY THE RESEARCH STAFF*

Effect of Temperature of Entrained Fluid on the Performance of Steam-Jet Ejectors, W. C. Holton and E. J. Schultz. *Transactions of the American Society of Mechanical Engineers*, October, 1951.

Effect of Molecular Weight of Entrained Fluid on the Performance of Steam-Jet Ejectors, W. C. Holton. *Transactions of the American Society of Mechanical Engineers*, October, 1951.

Coal Sampling by Large Increment Weights, B. A. Landry and W. W. Anderson. *Transactions of the American Society of Mechanical Engineers*, October, 1951.

Correlation of Structure and Test-Bar Properties of 85-5-5-5 Alloy, J. G. Kura and L. W. Eastwood. *Foundry*, November, 1951.

Improved Nylon Paint Brushes, M. J. Snyder, E. R. Hunt, and J. W. Clegg. *Brushware*, October, 1951.

Hydrostatic Pressing as a Fabrication Technique, H. E. Wagner and C. G. Harman. *American Ceramic Society Bulletin*, October, 1951.

Xeroradiography Can Cut X-Ray Inspection Costs, M. D. Phillips and S. A. Wenk. *Iron Age*, November 29, 1951.

A Metallurgist Looks at Fractures, C. H. Lorig. *Metal Progress*, November, 1951.

**In most cases reprints are available upon request to the Editor.*

Outlook for Plastics

by RANDALL G. HEILIGMANN

The author is in charge of plastics research at Battelle. He has written numerous articles and research reports, and is the holder of several patents in the field of plastics. He came to Battelle six years ago from industry. He is the chairman of the Columbus section of the American Chemical Society.

PLASTICS have emerged from the role of a substitute during World War II to a position as a regular on the team of materials which serves all of us every day. Production of plastics, currently at a record annual rate of two billion pounds, is ten times prewar consumption. This is still not enough to satisfy unprecedented military and civilian demand. Plans, however, for increasing both the supply of raw materials and the productive capacity indicate that the shortage may be alleviated to some degree within the next twelve to eighteen months. Moreover, when the country returns to "normalcy," the ever widening circle of civilian uses for plastics assures a firm basis for continued growth.

Plastics have "come of age" because they often do a job better and at less cost than do other materials. Ease of fabrication, lightness, durability, and attractiveness, together with chemical, electrical, and heat resistance, make possible a variety of properties that only plastics can supply. Products range from gadgets in the kitchen and piping in chemical plants to drapes in the living room and astrodomes on giant aircraft. Some sixty-five different plastic parts are made for airplanes; about forty-two for automobiles.

The phenomenal growth in the development of plastics from petroleum has been another vital factor in the industry's progress. Prior to World War II, the basic chemical components of plastics were derived largely as by-products from the coal industry's ovens. Beginning in the early 40's, however, demand for plastics far exceeded the capacity of coke ovens to supply raw materials. Without the switch to petrochemicals, the advance of plastics would have been seriously restricted.

The sensational rise of petrochemicals also provides the basis for future expansion in the plastics industry. For example, it has been estimated that by 1955 the country will require over 400 million gallons of benzene annually, as compared to 232 million gallons in 1951. Benzene is an extremely important basic material for a variety of plastics, of which nylon is perhaps best known to most of us. The potential quantity of benzene that can be made from current annual crude oil output has been estimated at 825 million gallons. Only a small amount of this potential has been used so far. The bulk of the supply has come as a by-product of the coking process in the steel industry and from imports. Expansion of petroleum facilities is currently aimed at increasing benzene production by 72 million gallons per year. As further expansion becomes economically worth while, the petroleum industry has the know-how, materials, and capital to meet the call.

Current shortages of plastics do not all stem from a lack of raw materials. Production capacity, in certain cases, has seriously limited the available supply, both with respect to military and non-military needs. Moreover, defense orders have seriously cut into the supply of plastics available for civilian needs. Where production is at present limited and materials are under complete allocation as, for instance, with polyethylene, the situation is acute. The squeeze is less tight where only partial allocation exists. In some cases, as with the phenolics, defense orders have recently increased from twenty to fifty per cent and the shortage is due to become worse, at least temporarily, now that sulfuric acid allocations have been cut.

As raw materials shortages are overcome, the productive capacity of plastics manufacturers will be correspondingly increased. A doubling of capacity for polyethylene is seen by the end of 1952. New units for the manufacture of styrene and vinyl chloride plastics are under construction.

Current expansion plans for polystyrene, which competes with synthetic rubber for large quantities of styrene, will be restricted, at least temporarily, by the expansion of the synthetic rubber program. Since the bottleneck to adequate supplies of styrene is largely a result of the scarcity of benzene, methods are being studied for making similar-type plastic materials from toluene. New derivatives, such as the methyl styrenes, may replace styrene for less exacting applications, like coatings, if toluene remains more available than benzene.

Paralleling the large volume increase of plastics, new kinds of plastics have appeared during the past year. Fiber-forming plastics bearing the trade names Orlon, Dacron, Dynel, and Acrilan are currently being

introduced. Another new plastic series, known as "Epoxy Resins," offers valuable additions to the casting, coating, and adhesive fields.

New applications for existing types of plastics materials are constantly in prospect as more is learned about the composition and methods of producing them. In many cases, a comparatively small improvement in properties will open an entirely new field of use. Polystyrene, now less brittle than formerly, is finding new uses. Notable among these is as a door seal for home refrigerators. Other new plastic products include lenses, housings for hand tools, protective films, protective coatings for linings, heat-resistant laminated structures, gaskets and gears, sealants, adhesives, and electrical insulators.

In the molding of plastic materials, great advances have been made in the production of larger articles. Television cabinets weighing over forty pounds are now molded, resulting in a large saving in fabrication costs. Such molded shapes have been made possible by the production of very large hydraulic presses and also by the introduction of resins with improved flow characteristics. Capacities of injection-molding machines have also been greatly increased. Machines of 300-ounce capacity are now available. Much larger ones are being planned.

Research in plastic materials has already established a firm foundation for future growth. When the knowledge of the structure of plastic materials twenty-five years ago is examined, the tremendous strides that have been made become apparent. The experience and know-how that have already been gained will serve as a jumping off point for probing further into ways and means of improving the properties of these extremely versatile materials. As this knowledge is acquired and as raw materials supply and productive capacity are improved, the volume and variety of plastic products, already great, will multiply.

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Discovery and invention do not spring full grown from the minds of men. The labor of a host of men, great laboratories, and long, patient, scientific experiment build up the structure of knowledge, not stone by stone, but particle by particle. This adding of fact to fact some day brings forth a revolutionary discovery, an illuminating hypothesis, a great generalization, or a practical invention. —*Herbert Hoover.*

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Yet I doubt not thro the ages
  One increasing purpose runs,
And the thoughts of men are widen'd
  With the process of the suns.
—*Alfred Tennyson*

Ceramics and Gas Turbines

by WINSTON DUCKWORTH

The author is one of the country's pioneers in research on the use of ceramics in jet engines and gas turbines. He first directed research in that field while an officer at Wright-Patterson Air Force Base. He joined the Battelle staff in 1946, where he has continued similar research. As a member of one of its subpanels, he has advised the government's Research and Development Board.

IN THE decade from 1940 to 1950, the gas-turbine engine has revolutionized aviation and has brought new concepts into the fields of electric power generation and railroad locomotive design.

This sudden rise to prominence of an engine of rather ancient conception was made possible by great strides in the development of high-temperature materials. Since the efficiency of a gas turbine depends upon a high peak cycle temperature, the gas turbine remained impractical until the development of special materials for high-temperature service. To further increase the efficiency of the gas turbine, the operating temperatures must be raised to still higher levels. Such an increase may conceivably be achieved by employing ceramic materials; the classic answer to problems of exceedingly high temperatures.

Efficiency and Temperature

The gas turbine engine works basically the same as any other heat engine. Gas is compressed, heated, and then expanded. The efficiency depends on the temperature at which expansion begins.

A rotary compressor compresses air destined for a combustion chamber downstream. The burning fuel-air mixture exits through a turbine wheel. The rotor blades of the turbine are exposed continuously to a temperature very nearly that of the gas at its peak cycle temperature (turbine-inlet temperature). Stator blades, which guide the gases against the rotor blades, and liners for combustion chambers are exposed continuously to temperatures of the same order. The peak cycle temperature, hence the efficiency of a gas turbine, is limited by the safe operating temperature of the "hot end." In modern commercial and military practice, turbine-inlet temperatures of 1300°F. and 1600°F., respectively, are used. Higher temperatures could mean higher efficiencies.

Temperature, Corrosion, and Stresses

Many applications other than turbines require materials to withstand temperatures above 1600°F., but none of these combine the demand with the stresses and criticalness of dimension found in the gas turbine. Here, essentially no distortion of shape can be tolerated.

Stresses from vibration and gas erosion can be expected on each part. Large temperature differences also occur and, depending on the material, significant thermal stresses might develop. The centrifugal stress in the rotor blades is, by far, the highest mechanical stress encountered. This stress depends on the peripheral speed of the turbine and the density of the blade material.

The atmosphere is, of course, oxidizing. Other corrosion problems may occur with certain fuels from contained lead or vanadium compounds.

To meet the requirements of present service, turbine manufacturers are using alloys containing elements in critical supply. The need to relieve this situation is still another factor in the problem of heat-resistant materials.

The Research Approach

The research approach of present interest is an exploration of the ceramic field for suitable materials. Research is in progress on ceramic parts which can be used advantageously to replace present alloy parts.

Today, many industrial processes depend on the high heat and corrosion resistance of ceramic materials. By elimination on the basis of melting point alone, the possibilities for substantial temperature increases are narrowed to a few metals on one hand, while innumerable ceramic compounds remain on the other. The metals suffer more than the ceramics from strategic availability considerations. Again, interest is enhanced by the low densities of most ceramics as compared to the heat-resistant alloys.

Conventional Ceramic Materials

The ceramic materials available during World War II generally were not adaptable to gas turbines. Unfortunately, the adjustments needed to improve their likelihood of success were rarely simple.

Conventional ceramic materials are characterized by the presence of a glass phase. Glass has notably poor resistance to thermal shock and tends to soften

and deform under stress at relatively low temperatures. Even if a ceramic material is almost wholly crystalline, with glass only as a contaminant, the glass phase may interfere with the continuity of the crystal phase and serve as a "lubricant" under stress at high temperature. The glass phase cannot be tolerated in structural parts for the hot zones of gas turbines.

The elimination of glass from the final product necessitates excluding silicates from the raw materials. Clay, among other raw materials, cannot be used.

Glass-Free, Refractory Materials

The development of a ceramic material for specific use in gas turbines might be conveniently divided into three main phases of research: (1) raw material selection, (2) forming, and (3) heat treating.

The initial selection of raw materials is based primarily on melting point, stability, and availability. There are many likely raw materials and combinations of raw materials which remain unexplored. Investigators are continuously uncovering additional refractory compounds of interest.

Investigations pertinent to gas turbines have been rather thorough on most of the refractory oxides. There is room for more research, however, on combinations of oxides. Good progress has been made with combinations of oxides and metals, oxides and carbides, and materials stemming from our background in carbide cutting tools. In the latter category, the development and evaluation of mixtures of titanium carbide and metal for rotor and stator blades is well advanced. There has been some work on the development of bodies of refractory nitrides, borides, silicides, and the like, singly or in combination with each other, or combined with metals. Attention also is being given to graphite, a material with many attractive properties but characterized by poor resistance to oxidation.

After selection of the raw materials, the next major problem is to form them into some desired shape. Considerable success has rewarded research on this problem. The raw materials for forming are normally prepared as fine, nonplastic powders. The use of various organic compounds as bonds and plasticizing agents has progressed to a point where they are commensurate with clay for ceramic forming. It is no longer much of a problem to use any of the conventional ceramic forming techniques of dust pressing, plastic extrusion, or slip casting, in the fabrication of shapes of such inorganic and organic mixtures. Further, it is often possible to produce these shapes with sufficient strength for easy machining while in the green, unfired state.

After appropriate curing or drying, the formed shape is subjected to a heat treatment or sinter. The changes which occur in the internal structure during sintering determine the properties of the final product. The mechanism of sintering is not fully understood at present, and the action is influenced greatly by several factors.

Normally, during the early stages of heat treatment, any organic materials present are oxidized and removed, or are volatilized with a carbon residue remaining. On further heating, the crystalline particles usually coalesce, and chemical reaction, recrystallization, or grain growth may occur. The nature and extent of the phenomena which occur in the structure are affected, often to a great extent, by impurities and minor additives, by the grain size and character of the raw materials, by the forming method used and degree of compaction during forming, and by the atmosphere during sintering.

Ceramic Bodies for Rotor Blades

In general, some of the appraisals of ceramic materials are empirical, based on service testing, while the others are theoretical, based on property determinations. The two approaches, of course, complement each other.

To review briefly, several ceramic bodies have higher ratios of tensile strength to density than some commercial alloys at temperatures in the range of 1500° to 2200°F. The strength of several ceramic bodies increases with temperature. Oxidation problems and difficulties with wheel cooling may be encountered in the use of ceramic bodies with high thermal conductivities, while lack of sufficient thermal-shock resistance may seriously limit the use of low-conductivity bodies. Normally, the non-oxide raw materials and metal incorporations contribute to high conductivity, while high oxide bodies exhibit low conductivity. In service tests, blades of both an oxide body and of a metal-bonded, titanium carbide body have been operated at temperatures above those presently used with alloy blades, but at lower rotor speeds, and under less severe thermal-shock conditions. These service tests revealed certain problems in the use of the ceramic bodies. There were stress concentrations between wheel and blade when the ceramic blades were substituted directly in present metal designs. Severe thermal shock, resulting from failure of the air supply, caused fracture of blades in one instance. Mechanical-shock problems also were encountered.

It is particularly significant that the shortcomings of ceramic blades in service tests are usually traceable to lack of ductility. A brittle-type fracture is characteristic of ceramic materials and, if ceramics are to be used, more must be known about it. Basic studies to increase knowledge of brittle fracture are under way.

Ceramic bodies are inherently stronger in compression than in tension as well as inherently brittle. The

compressive strengths of some of the oxide bodies are of the order of ten times their tensile strengths. This, of course, indicates that the best design would have ceramic parts either prestressed in compression or subject to compressive loads. If suitable designs could be evolved, prestressing offers possibilities of reducing thermal- and mechanical-shock problems, since failures from such shocks probably are basically tensile in nature.

Ceramic Bodies for Stator Blades and Combustion Chambers

Because of lower mechanical requirements, stator blades offer a somewhat more likely future for ceramic bodies than rotor blades. Ceramic stator blades, made from bodies too weak for rotor blades, but with good thermal-shock resistance, might be satisfactory. Even without higher operating temperatures, it is possible that such blades would reduce weight and cost if used to replace metal blades in present designs.

Ductility is a necessary feature in the combustion-chamber liners of present designs. This eliminates direct substitution of ceramic bodies for the sheet metal now used. There are indications, however, that metal-supported ceramic liners will withstand the conditions of service. Also, ceramic bodies might be used to insulate combustion chambers if the need becomes sufficiently acute to justify design changes. Considerable success has been met in so insulating much hotter rocket chambers.

Ceramic Coatings

In addition to the work on ceramic bodies, a large portion of the ceramic research pertinent to gas turbines is directed toward developing and evaluating refractory ceramic coatings for metals. These coatings are now being used in production turbines. They are not expected to afford outstanding benefits, but they are likely to extend significantly the usefulness of alloys, and few, if any, design changes are anticipated in order to use them. The primary purpose of the coatings is to seal the metal surface against corrosive attack and, secondarily, to provide thermal insulation.

Most of the work on coatings has been confined to the enamel type. These consist essentially of a thin layer of glass. Spall-resistant coatings have been developed to "fit" the low-alloy steels, and the significant heat-resistant alloys. The refractoriness of some of these coatings is such as to afford protection for long periods at temperatures up to at least 1800°F. In laboratory tests, coated specimens have been unaffected under conditions of time, temperature, and atmosphere which completely deteriorated uncoated specimens. In service tests, instances are reported where the enamel-type coatings have appreciably increased the life of rotor blades and combustion-chamber liners. The worth of these coatings, however, has not been established definitely through extensive service testing. It is not known, for example, whether they will permit increases in operating temperatures. The reasons for the reputed beneficial effects are not clearly understood. If they were, better coatings for the specific uses probably could be developed.

Another coating development has produced spall- and oxidation-resistant coatings of metal-ceramic combinations. Some of these appear to be more heat resistant than the enamel-type coatings, and more techniques have been developed for their application.

Attention is being given to new techniques for the application of coating materials not readily applied by conventional methods. The most generally useful method developed to date involves the "vapor-deposition process," in which the coating is formed by chemical reaction at the heated surface of the base material.

Conclusions

From the standpoint of pure ceramic technology, rapid advances have been made within the past few years in ceramic research relevant to gas turbines. Even so, there are a large number of uninvestigated raw materials and combinations of raw materials from which better gas-turbine components might be made. Also, much remains to be learned about brittle fracture and the mechanism of sintering in glass-free ceramic materials.

In general, several available ceramic materials might serve advantageously for parts operating in the hot zones of gas turbines. Coatings for metals are particularly attractive for immediate use, while ceramic bodies might afford more outstanding benefits. Design or operational adjustments may be necessary to obtain maximum performance from ceramic bodies. To evaluate and use all types of ceramic materials, close cooperation is required between ceramists and gas-turbine engineers. With this cooperation, gas turbines with higher operating temperatures, longer life, or both, and perhaps lower weight, seem within the realm of the not-too-distant future.

The life and soul of science is its practical application.—*Lord Kelvin.*

BATTELLE TECHNICAL REVIEW ABSTRACTS

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Plant and animal nutrition; insecticides; fungicides; fertilizers; weed control; soils; etc.

ANALYSIS—CHEMICAL AND PHYSICAL 22a
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APPARATUS, METHODS, AND STANDARDS 25a
Industrial measurement, inspection, and control; laboratory equipment and procedures (except when auxiliary to other subjects); standards and specifications.

CERAMICS 33a
Abrasives; inorganic cements; glasses; ceramic coatings; structural clay products; refractories; whitewares.

CHEMICAL TECHNOLOGY 37a
Chemical engineering and process equipment; chemistry of materials such as wood, paper, textiles, and coal and petroleum by-products; petroleum refining.

CHEMISTRY—GENERAL, INORGANIC, AND PHYSICAL 39a

CHEMISTRY—ORGANIC 42a

CLEANING, FINISHING, AND COATINGS—METALLIC 10a
Buffing and polishing; chemical and electrochemical cleaning and coatings; diffusion, dip, oxide, sprayed, weld-deposited, and vapor-deposited coatings; cladding.

CORROSION 20a
Theory, measurement, and prevention (except by means of coatings).

DESIGN 36a
Design of parts, equipment, and structures (except when auxiliary to other subjects); theoretical stress analysis.

ELECTRICITY AND ELECTRONICS 52a
Electrical and electronic theory, circuits, equipment, and applications (except when auxiliary to other subjects).

FOUNDRY PRACTICE 4a
Melting; casting; pouring; rigging; shakeout and trimming; molding; core and pattern making; metallurgical control.

FUEL TECHNOLOGY 30a
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GRAPHIC ARTS 56a
Printing and decorating processes, equipment, and materials; book manufacture; photography.

HEATING, DRYING, AND AIR CONDITIONING 32a
Space heating; cooling; humidification; materials drying and heating; equipment such as ovens, boilers, furnaces, heat pumps, and auxiliaries.

LUBRICATION AND FRICTION 35a
Lubricants and lubricating methods; friction fundamentals; nonmetallic bearing materials; oil filtration; lubricating-system design.

METALLOGRAPHY AND PRIMARY STRUCTURES 13a
Microscopy, diffraction methods and other techniques; phase diagrams; nuclear and crystal structures; microstructures; macrostructures. (For structures resulting from transformation or deformation see Sections 11 and 13, respectively.)

METALS—FABRICATION AND USES 29a
Miscellaneous fabrication procedures; applications of metals, alloys, and specific processes.

SECTION INDEX (Continued)

METALS—MECHANICAL PROPERTIES AND TESTS 17a
Elasticity and plasticity; stresses and stress analysis; fracture; creep; shear; hardness; fatigue; wear resistance; deformation structures.

METALS—PHYSICAL PROPERTIES AND TESTS 15a
Mass, thermal, thermodynamic, chemical, electrical, magnetic, and optical properties.

METALS—PRIMARY WORKING 6a
Preparation for working; forging; rolling; extrusion; swaging; tube making; wire and rod drawing; slitting, sawing, shearing, etc.

METALS—SECONDARY WORKING 7a
Drawing; impact extrusion; forming; stamping; machining and machinability; grinding; honing and lapping; strain hardening; shot peening; flame cutting.

METALS—SMELTING, REDUCTION, AND REFINING 2a
Smelting and reduction of ores; distillation of metals; electrolytic winning and refining; thermit processes; cementation; amalgamation; carbonyl, halide, and hydride processes; ingot practice.

METALS—THERMAL TREATMENT 10a
Homogenization; annealing; normalizing; patenting; quench, precipitation, and case hardening; tempering; stress relief; cold treatment; heating and cooling media. (For effects of thermal treatment, see Sections 11, 12, and 13.)

METALS—TRANSFORMATIONS AND RESULTING STRUCTURE. 14a
Diffusion; nucleation and grain growth; recovery and recrystallization; allotropic transformations; precipitation; eutectoid reactions; other solid-state reactions; liquid-phase reactions; solid-liquid, vapor-solid, and vapor-liquid reactions.

METALS—WELDING OR JOINING 8a
Welding; soldering; brazing; weldability and weld tests; bonding metals to nonmetals; adhesive bonding; mechanical fastening.

MISCELLANEOUS 57a
Research and research organizations; general metallurgical articles; mathematics; medical research; patent law; other unclassified subjects.

ORE AND MATERIAL BENEFICIATION 1a
Preparation and concentration of solid materials; roasting; calcining; sintering; nodulizing; briquetting; mineralogy.

PAINTS, VARNISHES, LACQUERS, AND ENAMELS 46a
Organic and inorganic coatings (except ceramic coatings); their composition, properties, application, and testing.

PHYSICS 48a
Theory and practice (except as covered in other sections). Includes aerodynamics; biophysics; flow of gases and liquids; deformation of solids; heat transfer; nucleonics; semiconductivity and superconductivity; ultrasonics; etc.

PLASTICS AND HIGH POLYMERS 43a
Polymerization; properties; testing; processing methods and equipment; compounding. (Does not include rubbers and surface-coating resins.)

POLLUTION AND WASTES 29a
Sampling, analysis, collection, prevention, and treatment of gaseous and liquid wastes, including smoke, fumes, odors, fly ash, dusts, aerosols, sewage, and industrial wastes; by-product recovery; meteorological, topographical, and biological effects.

POWDER METALLURGY 8a
Powder production and properties; mixing; compacting; sintering; post-sintering operations.

PRIME MOVERS 32a
Reciprocating engines; turbines; jet engines; rockets; locomotives; auxiliary equipment; power from atomic fission.

RUBBERS AND OTHER ELASTOMERS 46a
Polymerization; properties; testing; processing methods and equipment; compounding.

STATISTICS AND ECONOMICS 57a
Natural resources; supplies; production and cost data; articles on economic trends.

BATTELLE TECHNICAL REVIEW

ABSTRACTS

Volume 1, Number 1 January 1952

1. ORE AND MATERIAL BENEFICIATION

1* Production of Iron Sinter at Helen Mine. K. O. Cockburn. *Canadian Mining and Mettllurgical Bulletin*, v. 44, Nov. 1951, p. 745-753; disc., p. 753-754; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, 1951, p. 475-482; disc., p. 483-484.

Part I presents a factual description of equipment and practice. Part II gives a discussion of the principles and theory of sintering practice as borne out by experience at the Helen plant.

2* The Sampling of Small Coal. E. T. G. Emery. *Engineering*, v. 172, Oct. 12, 1951, p. 452-454.

Presents mathematical notes and graphical interpretation of the theory of coal sampling.

3* Froth Flotation of Coal. *Engineering*, v. 172, Oct. 19, 1951, p. 491-493.

Discusses the above. Process involves agitating and aerating slurry to which a small amount of one or more chemical agents have been added.

4 Katanga's Mineral Empire Based on Many Metals. Edgar B. Sengier. *Engineering and Mining Journal*, v. 152, Nov. 1951, p. 86-89; Dec. 1951, p. 92-96.

Reviews Central African enterprise which yields Cu, Zn, Co, Cd, Au, and Ag. Operations comprise open-pit and underground mining, concentration, smelting, and electrowinning. This installment is confined to a description of deposits and mining procedures, and production and labor-productivity data. Facilities for gravity concentration and flotation, smelting, leaching and electrolytic work are described.

5* Treatment of Coke. Robert Miller. *Gas Journal*, v. 268, Oct. 10, 1951, p. 101-102, 107-108, 111; disc., p. 111.

Covers progress of the coke from the retort discharge to the loading outlet of the hoppers and touches briefly also on the subjects of stocking and marketing. It describes the different types of conveyors, elevators, and screens.

6 Manganese: New Supply in Steel Slag. T. Metaxas. *Iron Age*, v. 168, Dec. 6, 1951, p. 111-112.

Describes 4 methods being worked out for the recovery of Mn. The process reported to be nearest commercial application is that of the Bureau of Mines station in Pittsburgh. A miniature blast furnace is producing from slag, a high-phosphorus spiegeleisen for conversion to a product similar to commercial grade Mn.

7 Ore: Humboldt Process Step by Step. W. G. Patton. *Iron Age*, v. 168, Dec. 6, 1951, p. 115.

Describes a process for the beneficiation of a low-grade, nonmagnetic iron-bearing ore, of the specular hematitic variety.

8 Recovery of Vanadium from Titaniferous Magnetite. Sandford S. Cole and John S. Breitenstein. *Journal of Metals*, v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1133-1137.

Recovery of over 80% of the vanadium values in titaniferous magnetite from MacIntyre Development, Tahawus, N. Y., was accomplished by an oxidizing roast with Na_2CO_3-NaCl addition. Process description is given for leaching of roasted ore and precipitation of V_2O_5 and Cr_2O_3 from leach liquor. Data are tabulated and charted. 20 ref.

9 Low Grade Bauxites and Clays as Potential Aluminum Resources. K. K. Kershner, C. W. Funk, and W. A. Calhoun. *Journal of Metals*, v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1138-1142.

Future resources of aluminum may require the utilization of low grade ores to provide more permanent protection for the nation. Aluminum minerals such as clay, shale, and high-iron laterites may become important sources. An evaluation of reserves is given. New laboratory results are reported on the Vereinigte desilication process. 22 ref.

10 Diamond Recovery from Grinding Wheel Sludge. R. G. Weavind and R. S. Young. *Metal Industry*, v. 79, Nov. 23, 1951, p. 440.

Describes the above carried out by treatment with aqua regia and fusion with potassium hydroxide, followed by skin flotation of the diamonds in an acid bichromate solution. The procedure is simple, and both the reagents and equipment are inexpensive.

11* Greenside Mine; Mining and Milling Practice. (Concluded.) C. Connor. *Mine & Quarry Engineering*, v. 17, Dec. 1951, p. 387-390.

Describes grinding and flotation practices in the recovery of Pb at above Mine. A flow sheet is given.

12* Heavy-Media Separation of Northern Alabama Iron Ores. J. B. Baker. *Mining Congress Journal*, v. 37, Nov. 1951, p. 45-48.

Describes commercial development of the above. Illustrated.

13 Basic Laboratory Studies in the Unit Operation of Crushing. J. W. Axelson, J. T. Adams, Jr., J. F. Johnson, J. N. S. Kwong, and E. L. Piret. *Mining Engineering*, v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 190, 1951, p. 1061-1069.

Basic investigations of crushing were concerned mainly with 3 phases of the problem: mechanism of the fracture process itself, particle-size distribution of the crushed product, and relationship between energy input, and amount of new surface produced. Data are tabulated. 55 ref.

14 Five Variable Flotation Tests Using Factorial Design. Adrian C. Dorenfeld. *Mining Engineering*, v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 190, 1951, p. 1073-1080.

Factorial design is a mathematical method of drawing valid conclusions from a series of tests made in a predetermined pattern. It is applied to flotation ore testing using, in this case, 5 variables, each varied twice, requiring a total of 32 tests. Representative conclusions were checked by repeat testing. Data are tabulated and graphed. 19 ref.

15* New Shaft and Concentrator at International Nickel. *Mining Magazine*, v. 85, Oct. 1951, p. 210-211.

Describes the above. Procedure by which the ore is carried from the mine through crushing and grinding operation is outlined.

1. *Ore and Material Beneficiation*

16* Nickel Slags. C. C. Downie. *Mining Magazine*, v. 85, Oct. 1951, p. 212-214.

Discusses properties, treatment, and utilization of the above.

17* Triumph Mill—Full Production. *Mining World*, v. 13, Dec. 1951, p. 22-26.

Describes practices carried on at the Triumph Mining Co. at Triumph, Idaho, in the recovery of Au, Ag, Pb, and Zn. Crushing and flotation operations are outlined. Illustrations.

18* "Sweat, Ingenuity, Dollars"—A New Mine for Howe Sound. *Mining World*, v. 13, Nov. 1951, p. 40-43.

Describes how the Calera Mining Co. has carved a cobalt and copper producer from Idaho's Salmon National Forest. Procedures in recovery of the metals are outlined.

19 Crystallization of Aluminum Chloride in the Hydrochloric Acid Process for Production of Alumina From Clay. Lewis Jesse Clark, Willard D. Hubbard, and James I. Hoffman. *Journal of Research of the National Bureau of Standards*, v. 47, Oct. 1951, p. 269-271.

When roasted clay is treated with dilute HCl, a solution is obtained that contains Al and other soluble constituents of the clay in the form of chlorides. Crystallization as the hydrated chloride, $AlCl_3 \cdot 6H_2O$, serves to separate the Al from the other soluble chlorides. A process is described for this crystallization on a large scale.

20* Sintering of Iron Ores. (In Polish.) **Part I. Theoretical Basis of the Sintering Process.** W. Madej and B. Sewerynski. **Part II. Effect of Increased Vacuum on the Sintering Process.** S. Holewinski, W. Madej, and B. Sewerynski. *Prace Glównego Instytutu Metalurgii*, v. 3, no. 5, 1951, p. 351-374.

In Part I, important factors such as grain size, agglomeration and compactibility were investigated. The problem of porosity and strength of sinters is discussed. A method of calculating sintering efficiency is described. In Part II, the effect of vacuum on sintering time of different ores was studied, as well as effects of various additions. Vacuum of about 1200 mm. H_2O was found best in most cases. Numerous graphs and tables.

21* Heavy-Media Separation Recovers Limestone from Zinc. Walter B. Lenhart. *Rock Products*, v. 54, Nov. 1951, p. 64-71.

Describes a process called HMS. It consists of placing minus 2-in. rock in a heavy fluid mixture, the density of which is easily and closely controlled. In this fluid, the lighter rocks float and the heavier ones sink thereby affecting a separation. Application of the process to Zn recovery is outlined. Flowsheets are given.

22* Sintering and Nodulizing Plant of Oliver Iron at Virginia, Minn. *Skillings Mining Review*, v. 40, Dec. 8, 1951, p. 1.

Briefly discusses processes and operation at the above plant.

23* The First Gold from the Free State Field. A Description of the St. Helena Reduction Plant. *South African Mining and Engineering Journal*, v. 62, pt. 2, Oct. 27, 1951, p. 341, 343, 345, 347, 349, 351, 353.

Surveys features of the above.

24* New Developments in the Band-Sintering Process. (In German.) Helmut Wendeborn. *Stahl und Eisen*, v. 71, Nov. 8, 1951, p. 1212-1218.

Surveys present status of equipment and procedures for sintering of fine iron ores. Describes a round sintering machine which sinters in 2 layers. Output is increased by lime addition. Oxidation phenomena are discussed. Diagrams and graphs. 17 ref.

25 New Rotary Unit Cools Sinter Economically. F. R. Greyson. *Steel*, v. 129, Nov. 19, 1951, p. 98, 101.

Novel method, which cools by ordinary atmospheric conditions without the aid of water or blowers, eliminates disintegration and breakage of the sintered iron ore used in blast furnaces.

26 Sylvester Process Extracts Manganese from Slag. George R. Sylvester. *Steel*, v. 129, Nov. 26, 1951, p. 84-85.

Describes the above, giving flow sheet of concentration process. Advantages are outlined.

27* Concerning Certain Micaceous Magnesium-Iron Ores. (In Russian.) D. P. Serdirchenko. *Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva*, ser. 2, v. 80, no. 3, 1951, p. 175-181.

Micaceous ores of the North Caucasus and Eastern Timan were investigated for contents and modes of occurrence of Fe, Mg, Li, Al, Si, K, etc. Data are tabulated. 21 ref.

28* Experiment on Application of Electron-Microscopic Method to Investigation of Ores. (In Russian.) A. A. Ivanov. *Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva*, ser. 2, v. 80, no. 3, 1951, p. 167-174.

Applicability of electron microscopy, using the oblique-replica method, to mineralogical investigation of highly dispersed substances is confirmed by investigation of dispersion of fine gold particles within the grains of pyrite, as well as at the grain boundaries. Electron micrographs.

Miscellaneous Publications

29 Preparation Characteristics of Coal Occurring in Westmoreland County, Pa. William L. Crentz, A. L. Bailey, and J. W. Miller. U. S. Bureau of Mines, Report of Investigations 4823, Oct. 1951, 17 pages. (TN21 Un3r)

2. METALS—SMELTING, REDUCTION, AND REFINING

30* Aluminothermic Production of Aluminum-Titanium Alloys. (In French.) Jean Cueilleron and Claude Pasgaud. *Comptes Rendus hedbomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 1, 1951, p. 745-747.

A series of Al-Ti alloys were prepared by aluminothermic reduction of TiO_2 in the presence of a flux and of a substance capable of furnishing oxygen, or in gaseous oxygen, the latter being brought to the surface of the mixture during the reaction.

31* Quality Control in Basic Electric Steel Making Practice. A. F. J. Edgerton. *Australasian Engineer*, Oct. 8, 1951, p. 74-81.

Deals with the basic principles of steelmaking and furnace operation. Covers materials used and effects of alloying elements added to the liquid steel in the light of specification requirements. Deals more specifically with Ni-Cr-Mo steels.

32 Internal Structure of Killed Steel Ingots on the Basis of Relative Rates of Solidification. Edward A. Loria. *Blast Furnace and Steel Plant*, v. 39, Nov. 1951, p. 1333-1337.

In order to develop basic information as an aid in understanding of the subject, some proposals are made for controlling the internal soundness and segragation of killed steel ingots on the basis of relative rates of solidification. Effects of the 4 components of heat abstraction during solidification are described and possible changes in mold design discussed in terms of accelerating vertical solidification. Includes micrographs.

33* Production of Sponge Iron in Metal Containers. (In Portuguese.) Fernando A. de Toledo Piza. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 240-246.

Possibility of shortening the production cycle of sponge iron by the Swedish Höganäs process was studied, in order to reduce the size of equipment.

34 Using Gases in Metal Production. E. Spire. *Canadian Metals*, v. 14, Nov. 1951, p. 10-12.

Describes new type of ladle in which gases are introduced through a porous refractory plug. It is used for degassing, desulfurization, and similar treatments.

35* The Physical Nature of Solid Condensates Produced in the Distillation of Volatile Metals. I. I. Betcherman and L. M. Pidgeon. *Canadian Mining and Metallurgical Bulletin*, v. 44, Nov. 1951, p. 730-735; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, 1951, p. 460-465.

Describes an investigation on the above. Work was confined to the sublimation and distillation of Mg and Ca but results are applicable to cases where the metal is liberated in the gaseous state by reduction of a suitable ore. Photographs are included. 12 ref.

36 Dollar-a-Pound Titanium? *Chemical Engineering*, v. 58, Nov. 1951, p. 278.

Production costs can go to this and even lower, say Japanese

owners, if they can operate their new process on a large enough scale. Four basic operations make up the process: reduction of iron sand in an electric furnace, producing charcoal pig iron and Ti bearing slag; chlorination of the slag, producing $TiCl_4$; purification of $TiCl_4$; and reduction of $TiCl_4$ with Mg and vacuum distillation to produce metallic Ti. Includes flow diagram.

37* Use of Pulverized Lime for the Desulfurization of Molten Pig Iron. (In French.) **I. Tests Made in a 3-ton Furnace.** B. Kalling, C. Danielsson, and O. Dragge. **II. Industrial Practice.** S. Fornander. *Circulaire d'Informations Techniques*, v. 8, no. 10, 1951, p. 1119-1140.
(Translated from *Jernkontorets Annaler*, v. 135, no. 3, 1951, p. 89-115.)
Previously abstracted from original.

38 Effect of Pressure on the Refining of Lithium by Distillation. R. R. Rogers and G. E. Viens. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 483-487.
The effect of distilling crude Li in the presence of the chemically inert gas argon and the chemically active gases, O_2, N_2, and H_2, at different pressures was investigated, and the results are given. Data are tabulated.

39* Preparation and Some Properties of Hafnium Metal. Felix B. Litton. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 488-494.
The Hf was separated from Zr by a fractional distillational procedure. Miscellaneous properties are tabulated. 18 ref.

40* Chemistry in Metal Extraction. F. D. Richardson. *Engineering*, v. 172, Nov. 2, 1951, p. 569-572.
Discusses the above with reference to the effects of physical chemistry and research on ferrous and nonferrous metal extraction. Current possibilities which may become important are presented. Major emphasis is on ferrous reactions.

41* Electrothermic Treatment of Nickeliferous Ores of Lokrys (Greece). (In French.) Corrado Ferrente. *Journal du Four Electrique et des Industries Électrique et des Industries Électrochimiques*, v. 60, Sept.-Oct. 1951, p. 115-117.
Describes the above with respect to the production of cast nickel and ferronickel, giving data on their composition and characteristics during processing.

42* The Removal of Aluminum from Red Brass. Part II. (In Swedish.) Ake V. Larsson and Börje Löfgren. *Gjuteriet*, v. 41, Oct. 1951, p. 143-151.
Shows that Al can be removed from red-brass melts by refining with fluoride-bearing fluxes. The soundness and mechanical properties of a red-brass alloy treated with such fluxes were investigated. Silicon can be removed by the same methods used for Al refining if the melt is free from Al. The influence of small amounts of Al and Si on soundness and mechanical properties was studied. The tendency of the melt to pick up sulfur, when refining with fluxes containing Na_2SO_4 as an oxidizer, was also investigated.

43* The Stürzelberg Process for Production of Pig Iron. (In German.) H. Reinfeld. *Giesserei*, v. 38, Oct. 4, 1951, p. 517-523.
Presents detailed description of new process of producing pig iron from iron pyrites. The problem, complicated by the presence of up to 10% Zn and 4-7% S, was solved by application of a short rotary reducing furnace. Flow charts and schematic drawings illustrate the article. Advantages and drawbacks are discussed. Properties of resulting pig iron are described.

44* Theory of Heat Transfer in Openhearth Furnaces and Its Consequences. (In Czech.) Antonin Benda. *Hutnické Listy*, v. 6, Sept. 1951, p. 433-439.
The relationships of heat consumption, thermal efficiency, and heat losses to furnace efficiency are determined. The amount of heat transferred during melting, also effective gas-volume regulation, are discussed. With the aid of theoretical calculations, general equations for minimum melt time and maximum furnace efficiency are derived. The equation of thermal characteristics is used to deduce the relation of specific consumption of heat to furnace size. Compares results to the work of Guthmann.

45* Metallurgy and Economics of Oxygen Enrichment in the Blast-Furnace Process. (In German.) Rudolf Graef. *Stahl und Eisen*, v. 71, Nov. 8, 1951, p. 1189-1198; disc., p. 1198-1199.
Reviews and correlates literature on the above. Also presents results of experimental investigation of various aspects such as reduction of nitrogen content of Bessemer steel, reduction of phosphorus content and of blowing time; possibility of refining low-phosphorus pig iron, and improvement of converter life. Disadvantages are also discussed, as well as preliminary slag refinement for recovery of V and Mn. 23 ref.

46 Discussion on the Paper—"The Reduction of Lump Ores." R. Wild and H. L. Saunders. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 110-113.
Paper published in v. 165, 1950, p. 198-214.

47 Joint Discussion on the Papers—"The Distribution of Temperature in Ingot Moulds and Its Relation to Ingot Structure,' I. M. Mackenzie and Andrée Donald; "Ingot Heat Conservation; Time Studies from Casting to Rolling," A. V. Brancker, J. Stringer, and L. H. W. Savage; and **"Ingot Heat Conservation; Mould and Ingot Surface Temperature Measurements,"** A. V. Brancker. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 113-117.
Papers published in v. 166, 1950, p. 19-28; v. 164, 1950, p. 68-84; and v. 165, 1950, p. 307-313; respectively.

48 Joint Discussion on the Papers—"The Thermodynamic Background of Iron and Steel Making Processes. II. Deoxidation." F. D. Richardson; and "Studies in the Deoxidation of Iron; Deoxidation by Aluminum," H. A. Sloman and E. Ll. Evans. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 118-125.
Papers published in v. 166, Oct. 1950, p. 137-146; and v. 165, May 1950, p. 81-90; respectively.

49 Discussion on the Paper—"Thermodynamic Aspects of the Movement of Sulphur Between Gas and Slag in the Basic Open-Hearth Process," F. D. Richardson and G. Withers. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 125-127.
Paper published in v. 165, 1950, p. 66-71.

50 Studies in the Deoxidation of Iron; Deoxidation by Manganese. H. A. Sloman and E. El. Evans. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 145-152.
Preparation, analysis, and microscopical examination of a series of ingots, made by adding O_2 and Mn to 300-400 g. melts of pure iron, are described. The analyses reported include estimations of the total O_2 and Mn contents of the ingots, and chemical and X-ray analyses of the non-metallic inclusions obtained by alcoholic-iodine extraction. The microscopical appearance of the inclusions in polished metal sections is described. The alcoholic-iodine method is shown to be unsatisfactory for the quantative extraction of inclusions with a high MnO content. A new calculation of equilibrium conditions for deoxidation by Mn using previously published data is given. 17 ref.

51 A Survey of the Sulphur Problem Through the Various Operations in the Steel Plant. T. E. Brower and B. M. Larsen. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1163-1171.
Surveys the steel-plant sulfur-distribution and elimination problem from coal to liquid steel ready for teeming, giving distributions of sulfur over a range of coke sulfur content; some methods of sulfur control in the blast furnace, external desulfurization between blast furnace and openhearth; distribution between fuel, slag, and metal; and methods and limitations of control of sulfur in the openhearth. 12 ref.

52 Improved Feeder-Head Tile for Ingot Hot Tops. H. O. Howson. *Metal Progress*, v. 60, Nov. 1951, p. 88-90.
Surveys the above giving an account of materials used. Discusses the development of recessed tiles and their application to mass production steelmaking.

53 Some Applications of Thermodynamics to Process Metallurgy. W. R. Moore. *Metallurgia*, v. 44, Oct. 1951, p. 194-195. (A condensation)
Briefly explains application of the above in miscellaneous fer-

2. *Metals–Smelting, Reduction, and Refining*

rous and nonferrous ore roasting and reduction processes.

54* Incorporating Scrap in Ore Smelting Processes. C. C. Downie. *Mining Journal*, v. 237, Oct. 5, 1951, p. 338-339.

Surveys briefly the methods adopted by large refineries with regard to the incorporation of nonferrous waste mterials in the regular ore charges.

55* Operation and Control of an All-Basic Open Hearth Furnace. F. Mitton. *Refractories Journal*, v. 27, Oct. 1951, p. 410-420.

Describes and diagrams the above. In addition to being an all-basic construction, it is also a single uptake furnace, operated with a charge control system, and with automatic control of fuel.

56* Use of Oxygen in the Basic Openhearth Furnace. (In German.) Kurt Heinrich. *Stahl und Eisen*, v. 71, Nov. 8, 1951, p. 1199-1204.

Describes enrichment of the combustion air in gas producers to 23.5% O_2 and increase of the calorific content of the gas to 1530 kcal. per cu. m. Advantages and disadvantages, including economic factors, are discussed.

57* Use of Oxygen-Enriched Air in the Openhearth Furnace and in the Gas Producer. (In German.) Wilhelm Baumgardt. *Stahl und Eisen*, v. 71, Nov. 8, 1951, p. 1204-1211; disc., p. 1211-1212.

Reviews the literature and presents tabular and graphical data on the above. Advantages are cited, particularly for short furnaces, because of reduced flame length. 21 ref.

58 Steel Density Controlled. *Steel*, v. 129, Dec. 10, 1951, p. 123.

Describes a process and methods for producing finished and semifinished steel products having any desired density and analysis within a wide range. Resultant article has the composition and structure of normal steel except that it contains a predetermined amount of spherical voids which are not interconnected.

Miscellaneous Publications

59 Cyanidation of Gold-Silver Ore from Manhattan, Nev. A. L. Engel. U. S. Bureau of Mines, Report of Investigations 4819, Oct. 1951, 6 pages. (TN21 Un3r)

Tests were made to investigate a proposed treatment method for gold and silver ore from the Keystone mine, Manhattan, Nye County, Nev. The ore was crushed to minus-10-mesh and separated into + and −65 mesh portions. The −65 portion is cyanided by leaching. Laboratory tests indicated that 89% of the Au and 49% of the Ag could be extracted.

See also:
246 (steel ingots and plates–structures)
277 (electrochemistry in metals production)

3. FOUNDRY PRACTICE

60 Heat Transfer Coefficients of Centrifugal Casting. C. L. Register, H. F. Taylor, and B. G. Rightmire. *American Foundryman*, v. 20, Nov. 1951, p. 34-37.

Temperatures in spinning cylindrical molds and tubular castings were determined by means of a series of thermocouples connected to recording potentiometers through specially designed commutators. Heat-transfer coefficient of Cu centrifugally cast in steel molds and of mold to air were calculated. Apparatus is diagrammed and illustrated.

61 Air Preheater Unit for Small Cupolas Aids Melt Efficiency. Lloyd G. Berryman. *American Foundryman*, v. 20, Nov. 1951, p. 40-42.

Describes and diagrams an economical heat excnanger that has materially increased cupola melting efficiency during a 5-yr. testing period at Texas A & M College. Data are charted

62 Calculating Riser Dimensions; A Basic Approach to Risering Gears. R. A. Willey. *American Foundryman*, v. 20 Nov. 1951, p. 46-50.

Describes method of computing riser dimensions worked out on the basis that the freezing rate of a casting or section of casting can be estimated by comparison of the surface areas dissipating heat and the respective volume, or ratio of section surface area to section volume. Freezing rates for risers of various sizes are tabulated on the same basis, and a comparison of casting section and riser freezing rates indicate riser size required for proper feeding.

63 Modern Foundry Methods; Industry-Sponsored Research. R. R. Lubker. *American Foundryman*, v. 20, Nov. 1951, p. 51-53.

Describes and illustrates experimental foundry facilities and research programs of Armour Research Foundation, Chicago.

64 Controlling Die-Casting Flash. W. M. Holliday. *American Machinist*, v. 95, Nov. 26, 1951, p. 135-142.

Presents general rules, practical hints, and tricks of the trade in the above. Illustrations and diagrams.

65* Metal Composition and Annealing of Blackheart Malleable Cast Iron. P. H. Shotton. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 68-72; disc., p. 72-73.

Effect of composition and annealing on the quality of the highest grade of blackheart malleable cast iron specified in B.S. 310 :1947, as melted in the air furnace or the rotary furnace, is discussed. C-Si relationship, Mn-S ratio, and P content are considered. Their requirements are then dealt with more fully in relation to the commoner defects occurring in blackheart casting, together with methods of establishing the most suitable composition by adjustments to the furnace charge. Briefly considers mechanism of the annealing process, and annealing cycle in relation to C and Si content.

66* Production of High Quality Whiteheart Malleable Cast Iron. K. Roesch. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 74-75; disc., 76-77.

Two methods were explored for development of a high-quality malleable cast iron: secondary annealing to modify pearlite; and melting of a low-S, low-Si malleable cast iron, with increased Mn content. A material of extraordinarily high toughness is obtained by suitable annealing.

67* The Fluidity of Molten Cast Iron. E. R. Evans. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 86-139.

Surveys factors which affect fluidity. This is followed by details of experimental work carried out in the BCIRA laboratories to determine the relative effects of the main factors influencing the fluidity of molten cast iron. Attention is paid to the effects of composition and pouring temperature. A modified form of the spiral fluidity test was adopted which is apparently independent of variations in mold conditions. Relative effects of C, Si, and P on fluidity and solidification temperature of various irons were determined. Effects on fluidity of pouring temperature and of Mn, S, Ni, Cu, Cr, Mo, Ti, V, Zr, Al, Te, B, Ce, and Mg were also determined. Field tests in 4 foundries gave results which compared favorably with those obtained in the laboratory. Numerous tables, graphs, and diagrams. 28 ref.

68* On Metal Penetration in Casting. (Report 2.) Jiro Kashima. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 11-14.

Reports results of investigation of the above for various special steels such as Cr steels and Mn steels. Data are tabulated.

69* Absorption of Gases in Aluminum Castings. Shigeo Oya. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 33-37.

Presents an investigation of the factors involved in the occurence of gas holes owing to the conditions of operation in the process from melting to casting. Data are graphed.

70* On Molding Sand Binders. Toshisada Makiguchi. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 38-41.

The relation between temperature and strength was studied for organic and inorganic binders. Data are tabulated.

71* On Camlachie Cramp. (Report 1) Especially on Chaplet. Tsunemitsu Muraki. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 50-53.

Presents a study on the above. Includes consideration of the relation between surface conditions of the chaplet stem and welding, relation between moisture absorbed by the oxide film, and formation of blow holes, and influence of rust on solid metal. Data are tabulated.

72 The Basic-Lined Cupola. J. P. Holt. *Foundry*, v. 79, Dec. 1951, p. 92-95, 264-268.

Presents recommendations for installation of the lining and operation of the above. Illustrations.

73 Tiny Engines Are Big Business. Pay Dwyer and Robert H. Herrmann. *Foundry*, v. 79, Dec. 1951, p. 96-97, 269-271.

Describes miniature castings produced at Miniature Engine Laboratories, Sandusky, Ohio. Application of the foundry equipment to work of a specialized nature involving complicated partings is discussed. Most castings are 85-5-5-5 bronze or aluminum.

74 Gates and Heads for Steel Castings. John Howe Hall. *Foundry*, v. 79, Dec. 1951, p. 104-109, 192.

Discusses the development of step gating, the application of swirl gates, and the principle of partial or complete reversal of the position of the mold after pouring. Illustrations. (To be continued.)

75 Observations on Bronze Foundry Practice. Harold J. Roast. *Foundry*, v. 79, Dec. 1951, p. 110-111.

Describes various methods employed in casting bronze parts.

76 Factors Affecting the Quality of Cast Steel. T. N. Armstrong. *Foundry*, v. 79, Dec. 1951, p. 114-117, 207-208.

Presents a survey on the above. Effect of additions on mechanical properties is stressed. Micrographs. Data are graphed and tabulated.

77 Thermal Considerations in Foundry Work. V. Paschkis. *Foundry Trade Journal*, v. 91, Nov. 1, 1951, p. 507-513; Nov. 8, 1951, p. 530-534, 536.

Extensive oral and written discussion of the above paper (by V. Paschkis) June 21 and 28 issues.

78 Foundries in the French Ardennes. A. R. Parkes. *Foundry Trade Journal*, v. 91, Nov. 8, 1951, p. 525-529.

Illustrated description includes more extensive details of one particular foundry which has an unusual mechanized system for cast-iron production in sand molds.

79 Production of Heavy Castings for Electrical Generating Equipment. N. Charlton. *Foundry Trade Journal*, v. 91, Nov. 22, 1951, p. 585-590; disc., p. 590-593.

Detailed discussion of methods and procedures for the above.

80 Core Sand Collapsibility Test. I. J. Birch. *Foundry Trade Journal*, v. 91, Nov. 22, 1951, p. 595-596.

Describes the above test for assessing the collapsibility of various types of core binders. Core sands tested were Al core sands, hence RR-50 alloy was used in all tests.

81* The Theory of the Cupola Process. (In Swedish.) H. Jungbluth. *Gjuteriet*, v. 41, Sept. 1951, p. 127-132.

Points out that it is possible to treat mathematically the factors controlling cupola process to a considerable extent. A basic formula is given showing melting rate as a function of blast volume, coke ratio, and rate of combustion. A modification of this formula makes it possible to predict the influence of preheated blast and oxygen enrichment on the melting process. The relationships are represented graphically.

82 Experiments on the Reaction of Aluminum-Magnesium Alloys With Steam. A. J. Swain. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 125-130.

The reaction of Al-Mg alloys containing up to 25% Mg with pure steam was investigated for temperatures from 450 to 700°C. Maximum reactivity, dependent on composition, was found at temperatures between 550 and 625°C. Significance of these results in relation to metal mold reaction in the Al + 10% Mg alloy is discussed briefly.

83 Jobbing Foundry Adopts C-Process for Making Shell Molds. A. W. Calder, Jr. *Iron Age*, v. 168, Nov. 15, 1951, p. 111-116.

Illustrates and describes application of shell-molding or Croning process by Builders Iron Foundry, Providence, R. I. for making Mechanite castings. Advantages lie in the quality of the casting produced, the inherent savings in metal and alloys, and the close tolerances to which the castings can be produced.

84 Rugged Vacuum Furnace Built for Semi-Production Use. J. M. Taub and D. T. Doll. *Iron Age*, v. 168, Nov. 15, 1951, p. 125-128.

Describes practical all-metal vacuum furnace which will melt from 5 to 50 lb. of metal. A minimum of glass or quartz compounds is used. Chief metal used is stainless steel. Either resistance or induction heating units can be employed. Maintenance is reduced to a minimum.

85 Problem Castings Can Be Turned Into Production Jobs. T. J. McLeer. *Iron Age*, v. 168, Nov. 22, 1951, p. 86-89.

Distortion, shrinkage and feeding difficulties characterize 5 problem castings produced by a stainless-steel foundry. A jet-engine support with spindly, multiple arms and a 2-ton, 4-blade propeller were among the jobs that had to meet close tolerances. Illustrations are given.

86 Steel Castings. *Iron and Steel*, v. 24, Nov. 1951, p. 493-496.

Describes and illustrates the layout for varied production at the Grimesthorpe Steel Foundry, England.

87 Mechanism of Grain Refinement in Aluminum Alloys. F. A. Crossley and L. F. Mondolfo. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1143-1148.

Above mechanism by the addition of small amounts of Ti, Mo, Zr, W, and Cr to Al was investigated. Results indicated that the grain refinement is caused by the peritectic reaction which, by transforming the intermetallic compound into crystals of Al solid solution, seeds the melt with nuclei above the freezing point of Al. Graphs, tables, and photomicrographs. 15 ref.

88 Melting and Sintering of Metals in Vacuo. E. D. Malcalm. *Journal of Scientific Instruments*, Supplement 1, 1951, p. 63-66.

The advantages and application of the above are surveyed. The various problems peculiar to the use of a furnace in a vacuum enclosure, and the design of such a furnace suitable for melting 50-100 lb. of steel are discussed.

89 Shell Molding. Bernard M. Ames. *Machine Design*, v. 23, Dec. 1951, p. 239-240. (A condensation.)

Describes the above which utilizes the thermosetting properties of phenolic resins to provide a bond material for silica grains in the construction of a mold.

90* A Self-Contained Melting and Holding Furnace for Diecasting Foundries. *Machinery Lloyd* (Overseas Edition), v. 23, Nov. 10, 1951, p. 89, 91.

Describes the above. Outstanding advantages include low initial and maintenance costs, as well as extremely pleasant working conditions for the diecaster, due to the convenient height, absence of flame and reduced radiation. Finally, starting up is rapid and the metal used can quickly be changed.

91 What Is Fluidity? T. P. Yao and V. Kondic. *Metal Industry*, v. 79, Nov. 23, 1951, p. 435-437.

Reviews the present position of fluidity testing and provides additional data which are necessary to interpret the fluidity results. Variables such as metal composition, pouring temperature, and hydrostatic head are considered. Graphs.

92 Temperature of Molds and of Filling the Mold. (In French.) R. Grunberg. *Métallurgie et la Construction mécanique*, v. 83, Oct. 1951, p. 753, 755, 757.

Discusses the above with respect to temperature influences on the surface, mechanical characteristics, dimensions of the casting, and factors influencing the rate of filling the molds used in die casting. Data for Zn and Al and their alloys are charted and tabulated.

3. *Foundry Practice*

93 Foundry Core Driers. *Modern Plastics*, v. 29, Dec. 1951, p. 108-109.

Tells how the adoption of fibrous glass reinforced polyester resin for driers and core boxes has greatly expanded the use of electronic baking of foundry cores made of sand and urea resin. This eliminates cast Al, which is used for driers in the conventional core-drying operation.

94 Investment Casting: Alloy Selection and Design. D. V. Ludwig and R. L. Wood. *Product Engineering*, v. 22, Nov. 1951, p. 184-190.

Precision investment casting has proven to be ideal for many intricate machine parts. Presents important facts needed for selection of alloys and design of parts which often determine whether a part will be a satisfactory and economical one. Numerous schematic diagrams.

95* Influence of Vacuum Melting on the Properties of 25% Chromium Ferrites. (In French.) J. Hochmann. *Revue de Métallurgie*, v. 48, Oct. 1951, p .734-758; disc., p. 758.

The action of vacuum remelting made under well-defined conditions on certain properties of 25% chromium ferritic stainless steels is examined. Analyzes degasification conditions, charge composition, hydrogen content, and synthetic casting techniques. Influence on properties with respect to friction, shock resistance, and inter-crystalline corrosion after treatment at 900-1200°C., and with respect to hardening, fragility, and intergranular corrosion after heating between 400 and 500°C., was investigated. Includes photomicrographs, tables, and graphs. 39 ref.

96 Cast Production Molds. John Starr. *Tool Engineer*, v. 27, Dec. 1951, p. 40-43.

Discusses techniques involved in production of the above. Patterns, molds, and alloys for metal and nonmetal forming and casting are discussed in detail.

See also:
246 (casting of steels)
252 (nodular cast-iron production)
253 (gases evolved during solidification of cast iron)
522 (investment-casting alloys)
661 (die-casting die design)

4. METALS—PRIMARY WORKING

97* Copper and Brass Tubes. Leonard F. White. *Australasian Engineer*, Oct. 8, 1951, p. 65-69.

A summary of the principal uses of copper and brass tubes and the most commonly used alloys. Gives a general account of the most important methods of manufacture.

98 The Heating of Rounds for Piercing. W. Trinks. *Industrial Heating*, v. 18, Nov. 1951, p. 2023-2024, 2026, 2028, 2030, 2032, 2034, 2036.

The word "piercing" refers to the cross-rolling process in which an internally weakened round bar with a partially disintegrated center is forced over a piercer-point. The process is known as the Mannesmann process. Furnaces are described, schematically diagrammed, and discussed at some length.

99 New Rolling Method Eliminates Surface Defects. Norman C. Rendleman. *Iron Age*, v. 168, Nov. 15, 1951, p. 122-124.

Tells how diamond and square rolling are used to eliminate deep seams, spongy surfaces, and other defects in semifinished products on secondary mills. Scarfing and chipping to remove defects are not necessary to produce a good product, even in the difficult Bessemer grades, when using this rolling method.

100 Formability of Titanium Investigated. O. A. Wheelon. *Iron Age*, v. 168, Dec. 13, 1951, p. 140-143.

Studies on the above show that in general Ti forms like Mg and machines like stainless steel. Most forming must be done hot. Studies included use of stretch forming, the Hydropress, power brakes, rolls, and planishing hammers.

101 Rare Earths Improve Forgeability of Stainless. E. B. Post, D. G. Schoffstall, and H. O. Beaver. *Iron Age*, v. 168, Dec. 6, 1951, p. 162-163.

Describes use of the rare-earth elements to improve the hot-workability of austenitic Cr-Ni and high-alloy stainless steels. Effect is exceptionally marked in some alloys where the metal is converted into a commercial wrought product from a metal previously considered to be non-hot workable. In other metals, the effect is to improve existing hot-workability as evidenced by better ingot-to-billet yields, less billet preparation, and better-hot-rolled strip surfaces.

102 Instrumentation for Improved Rolling Temperature Control. L. D. Culp. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 85-90; disc. p. 90-91.

Discusses the very important part that temperature plays in the rolling of quality steel product and also describes the instrumentation that is available for measuring, indicating, and recording these temperatures.

103 Cooling Beds for Bar Mills. W. Udall. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 257-276.

Reviews briefly the evolution of the merchant bar mill during the last 50 years. Several of the earlier and later types of cooling bed and bed mechanisms are described and various factors governing their location and operation are discussed. Theoretical and practical observations relating to thermal treatment and cooling capacity are included, and suggestions are made regarding possible future developments.

104 Induction Heating in the Drop-Forging Industry. G. W. Seulen. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 483-489.

Various induction heating units for use in forging are described in some detail together with their advantages and disadvantages. Illustrated.

105* Hot and Cold Forging Methods. C. W. Hinman. *Modern Machine Shop*, v. 24, Dec. 1951, p. 132-134, 136, 138, 140, 142.

First of a series of articles which will deal with the equipment and methods used in the above.

106* Critical Analysis of Various Theories of Rolling. (In Polish.) Z. Wusatowski. *Prace Glównego Instytutu Metalurgii*, v. 3, no. 5, 1951, p. 389-416.

Reviews recent theories of the rolling process. In the 1st part, friction during the rolling process is discussed. In the 2nd part, the theories of Nadai, Celikoff, and Orowan are reviewed. The theory of Orowan is analyzed on the basis of published reports. 27 ref.

107* Contribution to the Problem of Cracking During Size Reduction of Steel Wire. (In German.) Wilhelm Püngel. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1137-1140.

Describes and illustrates the cracking of wire during hammer-mill reduction. Effect of rotation rate of the hammers on twisting of the cores of the wires was determined. Means of avoiding this type of failure are discussed.

108* Temperature Measurement by Means of a Wire-Die Thermocouple During Wire Drawing. (In German.) Werner Lueg. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1140-1145; disc., p. 1145-1147.

Describes and diagrams apparatus for the above. Patented steel wire was studied. Effect of reduction rate, sequence of drawing operations, friction due to springiness, die bearing length, plastic properties, strain hardening, drawing speed and lubricant, and wire quality were determined. Data are charted; conclusions are summarized.

109* Drawing Capacity and Output Requirements of the Multiple Two-Bar Drawing Process. (In German.) Anton Mackert. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1156-1160; disc., p. 1160-1161.

Describes, diagrams, and illustrates reconstruction of a 40-ton drawbench for 2-bar drawing. Details of operating procedures are given. Power imput was investigated for 3 speed ranges in single and 2-bar drawing of different steels. Data are charted and tabulated.

110 Cerium and Lanthanum Improve Hot Workability of Stainless. C. B. Post, D. G. Schoffstall, and H. O. Beaver. *Steel*, v. 129, Dec. 10, 1951, p. 88-91.

Alloy additions of Ce and La in the range of 0.08-0.18% were

found to improve hot-workability of Ni-Cr-Mo-Cu and other high-alloy stainless steels. Micrographs.

111 Stainless Fabricating Methods Successfully Form Titanium Sheet. *Steel*, v. 129, Dec. 17, 1951, p. 94-95, 110.

Describes how machines and procedures used to form intricate stainless structures can be adapted to shape Ti. In studies completed recently at Ryan Aeronautical Co.'s development laboratories, flat Ti sheet was formed to complex shapes. Describes an experimental production procedure to determine the behavior of titanium when welded, formed, and heat-treated.

112 British Experience With the Counterblow Forging Hammer. Paul Granby. *Steel Processing*, v. 37, Nov. 1951, p. 562-566, 585.

Reports generally and specifically on the above. Diagrams are given.

See also:
137 ("Forming Alco Aluminum"—book)
271 (rate of reduction vs. properties of stainless-steel wire)
322 (forging of high-speed steels)
329 (tracer study of wear of wire-drawing dies)
349 (new Cu alloys for wire)
521 (fabrication of Al alloys for cable sheathing)

5. METALS—SECONDARY WORKING

113* Stretch-Forming: Final Properties Achieved in the Material; Tendency to Grain-Growth. G. B. Evans. *Aircraft Production*, v. 13, Nov. 1951, p. 332-334.

Discusses the above, giving results of experiments on Al alloys. Only in the case of material stretched and without further heat-treatment can the final properties be estimated with reasonable assurance, assuming the material to be normal to start with. In all other cases grain-growth may set in if control is not exercised and the deterimental character of such growth needs no emphasis. Graphs. 11 ref.

114 Metallurgical Considerations in Machining. V. How Workpiece Structure Affects Tool Life. Milton C. Shaw and Prescott A. Smith. *American Machinist*, v. 95, Nov. 12, 1951, p. 138-141.

Concluding installment explains the behavior of carbon steels, alloy steels, austenitic materials, and cast irons. Tables and graphs.

115 Cutting Speeds May Double or Triple When Science Guides Machining. E. J. Tangerman. *American Machinist*, v. 95, Nov. 26, 1951, p. 144-147.

Discusses cutting speeds, fluids, and temperatures in the above. Tests on 3 common high-temperature alloys, Inconel X, Timken 16-25-6 and 5-816 are presented. A recent bibliography on machinability and high-speed machining is given. 50 ref.

116 Controlled Pressure Aids Deep Drawing. Wm. M. Stocker, Jr., editor. *American Machinist*, v. 95, Dec. 10, 1951, p. 138-142.

Surveys the advantages and disadvantages of two recently developed sheet-metal forming processes: Marforming and Hydroforming. Diagrams and illustrations.

117 Contour Turning. A Special American Machinist Report to the Metalworking Industries. Miles J. Rowan. *American Machinist*, v. 95, Dec. 10, 1951, p. 149-172.

An over-all picture of modern tracer-controlled turning. Describes basic tracing systems and how they operate. Outlines limitations, explains numerous job studies.

118 Surface Grinding of Titanium. Leo P. Tarasov and Gordon T. Rideout. *American Machinist*, v. 95, Dec. 10, 1951, p. 183, 185.

Gives results showing beneficial effects of low wheel speed obtained with vitrified-bonded wheels on a small surface grinder.

119* Study of Shrinkage Fitting. (In Portuguse.) Ferrucio Fabriani. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 321-345.

Theoretical review of the above. Distinguishes between force fit, shrink fit, and freeze fit. Attempts to systematize the entire problem.

120* On the Improvement for the Machinability of Cast Al-Alloys. Fusao Hayama. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 20-24.

For improvement of the surface-finishing properties of cast Al alloys, Bi or Sn were used. Both Bi and Sn have a similar effect. The tensile strength of the Al alloy containing Sn is slightly lower, but yield point and extension are not changed. The effect of heat-treatment is scarcely changed by addition of Sn, and surface finish of the heat-treated alloy is better than that of the non-heat-treated alloy.

121* Some Factors Affecting Wear on Cemented Carbide Tools. E. M. Trent. *Engineer*, v. 192, Nov. 9, 1951, p. 599-600.

Surveys the above. Experiments were carried out to determine the temperatures at which carbides react with steel to give a molten phase. A theory of cratering wear on carbide tools is proposed.

122* Dynamometer for Torque and Thrust Due to Drilling. R. C. Brain and H. J. Hulf. *Engineering*, v. 172, Oct. 19, 1951, p. 487-488.

Describes the "Sunbury" drill dynamometer which was designed and constructed at the Sundbury research station of the Anglo-Iranian Oil Co., Ltd. It is used for measuring torque and thrust loads exerted by twist drills, and has proved to be of considerable value in research into the behavior of cutting fluids during drilling operations.

123 Presses for the Jet Age. *Fortune*, v. 44, Dec. 1951, p. 110-113, 146, 148.

Describes the role of closed-die forging presses of the size 25,000 to 50,000 tons in the production of modern planes. The U. S.'s deficiency in forging and extrusion presses is discussed in detail. Diagrams and illustrations.

124* Directional Variation of Grinding Hardness in Silicon Carbide (SiC.) J. A. Kohn. *Industrial Diamond Review*, new ser., v. 11, Oct. 1951, p. 211-212; Nov. 1951, p. 235-237.

Discusses the above. Data were obtained with standard diamond-grinding equipment, using SiC as the abrasive. Results indicate that cleavage plays an important role.

125 Single Draw Produces Silicon-Copper Hemispheres. James A. Leake. *Iron Age*, v. 168, Nov. 29, 1951, p. 84-85.

Describes how 3 dies in one stroke of a large hydraulic press perform 3 operations required to make finished hemispheres. Yield is thus one finished piece per stroke. Formerly, 3 draws, interstage annealing, restrike, trim and piece operations were required. After press operations, the draw parts are stress relieved.

126 Flame Cutting. Robert Sibley. *Iron Age*, v. 168, Nov. 15, 1951, p. 117-119.

Describes how compounded hydrocarbon, combined with oxygen, cuts cleanly any armor plate thickness, leaving it ready for welding without further finishing. Speeds are average for flame cutting and a newly designed torch nozzle is the only special equipment required. Bevel edge angles as low as 20° are easily flame cut. Diagrams.

127 Grinding Methods Evolved for Titanium. *Journal of Metals*, v. 3, Dec. 1951, p. 1128-1129.

Results, showing the unexpected beneficial effects of low wheel speed, were obtained solely with vitrified bonded wheels on a small surface grinder. It is possible that similar results will be obtained with vitrified bonded wheels in other precision operations such as cylindrical or internal grinding, but experiments have not yet verified this assumption.

128* Designing Carbide Dies. M. L. Backstrom and E. J. K. Reitler. *Machinery* (London), v. 79, Nov. 8, 1951, 795-801.

Discusses mechanical properties of the material in the above. Application to blanking, piercing, forming, and drawing of various materials. Diagrams and illustrations.

129* Shot Peening As a Factor in the Design of Gears. John C. Straub. *Machine and Tool Blue Book*, Dec. 1951, p. 163-166, 168, 170.

Discusses effects on strength and pitting and scoring resistance.

5. *Metals—Secondary Working*

130 Cold Headed Parts. Philip O'Keefe. *Materials & Methods*, v. 34, Nov. 1951, p. 85-100.

Bolts, screws, rivets, nails, nuts, electrical terminals, anti-friction bearing balls and rollers, and other small metal parts are mass produced by cold heading. Manual outlines manufacturing, metallurgical, and cost factors which must be considered to specify cold heading or to design coldheaded parts. Includes production methods and machines; headability of metals and alloys; design of cold-headed parts; and competitive place of cold heading.

131* A New Heavy-Duty Light-Metal Machining Alloy As An Example of the Application of Experiences With Bearings to the Machining Process. (In German.) A. Röhenbeck. *Metall*, v. 5, Nov. 1951, p. 486-489.

Describes theoretical basis and experimental development of Al alloys fulfilling the 4 prerequisites of machining alloys. The cutting edge is lubricated by liquid metal (lead.) Experiments with "Ledloy" confirm the conclusions presented. Micrographs. 10 ref.

132* Sheet Stock: Ideas to Help Stretch It. *Modern Industry*, v. 22, Nov. 15, 1951, p. 39-47.

Describes and illustrates how new machines, and new ways to handle materials, help conserve short supplies, and cut costs. Applications to steel, Al, and Cu are discussed.

133* Bandsawing Light Metal Castings. *Modern Metals*, v. 7, Nov. 1951, p. 52.

Presents tabular data on production bandsawing of Al and Mg castings, collected from several foundries.

134* Economic Effects of Cemented Carbide Alloys Upon Machining and Chipless Forming. (In German.) Julius Holzberger. *Stahl ünd Eisen*, v. 71, Oct. 11, 1951, p. 1098-1102.

Discusses recent developments in the above, including review of the literature. Data are charted and tabulated. 11 ref.

135 Use of Oxy-Acetylene in Pipe Fabrication. E. P. Auler. *Steel Processing*, v. 37, Nov. 1951, p. 555-559.

Describes the above as a convenient source of localized heat. Oxy-acetylene cutting torch, gouging torch, and flame of a heating torch are discussed in detail. Illustrations.

136 Butt Brazing Carbide Tools Without Tip Pockets. David Kauffman. *Tool Engineer*, v. 27, Dec. 1951, p. 33-36.

Discusses methods which may be used to eliminate the strains caused by butt brazing. Diagrams are given.

Books

137 Forming Alcoa Aluminum. 77 pages. 1951. Aluminum Company of America, Pittsburgh, Pa. (TS555 A82alc)

Describes recommended procedures for the above. Includes blanking and piercing, drawing, embossing, coining, stamping, spinning, tube and shape bending, and other mechanical forming methods. Numerous diagrams, graphs, tables, and illustrations.

138 Machining Alcoa Aluminum. 68 pages. 1951. Aluminum Company of America, Pittsburgh. (TS555 A82ma)

Outlines specific, desirable characteristics in tools for machining aluminum and its alloys, suggests speeds, feeds, and depths of cuts which will operate these tools satisfactorily; indicates where common practice as well as tools of standard design may be used, and points out where the use of special practices or tools will produce better results.

See also:
100 (secondary fabrication of Ti)
246 (forging of steels)

6. POWDER METALLURGY

139 Refractory Bodies Composed of Boron and Titanium Carbides Bonded With Metals. James A. Nelson, Tracy A. Willmore, and Raymond C. Womeldorph. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 465-473.

Presents results of a study of mixtures of various carbides in finely divided form compacted with Ni, Fe, Co, Ti, or Cr and fired in an argon atmosphere at temperatures between 1925 and 2065°C. The reactions occurring between the carbides and metals are discussed and the compositions showing the greatest promise for further work are indicated. Strength properties are tabulated.

140 Stainless Steel Powder for Mechanical Parts. Arthur H. Grobe and Raymond Hoffman. *Product Engineering*, v. 22, Dec. 1951, p. 168-172.

Shows that type 316 powder can be pressed and sintered at pressures and temperatures which are commercially feasible. Mechanical properties of the finished parts are discussed. Applications are given. Data are tabulated. Photomicrographs.

141 Sintered Aluminum of High Heat Resistance. (In French.) Roland Irmann. *Revue de l'Aluminum*, v. 28, July-Aug. 1951, p. 269-275; Sept. 1951, p. 311-316.

Various processes for obtaining pure Al powders and sintering them were investigated, also their constitution, shape, and oxide content. Mechanical and physical properties are tabulated and charted. Structures of the powders are illustrated by photomicrographs. Applications are briefly discussed.

142* Developments in the Technique of Manufacturing Cemented-Carbide Alloys. (In German.) Carl Ballhausen. *Stahl ünd Eisen*, v. 71, Oct. 11, 1951, p. 1090-1097.

Describes development of electric furnaces for production of the above, especially the carbon-tube furnace. Also describes developments in mixing, crushing, grinding, screening, drying, shaping, and sintering used in production of the above. Numerous equipment diagrams.

143* The Properties of Sintered-Iron Parts as Related to the Types of Powders Used and Their Processing Conditions. (In German.) *Stahl ünd Eisen*, v. 71, Oct. 11, 1951, p. 1103-1114.

Comprehensive correlated summary of such properties as corner strength, shrinkage, surface conditions, oxygen content, chemical purity, compressibility, mechanical properties, and densities of various Fe powders. Also covers compacting and sintering processes and mechanical properties of the sintered parts. Numerous graphs and tables. 22 ref.

See also:
520 (electronic cores from metal powders)

7. METALS—WELDING OR JOINING

144* Experimental Determination of the Distribution of the Strains in the Joints of Single-Line Rivets Subject to Static Stressing. (In Italian.) E. von Burg. *Alluminio*, v. 20, Sept. 1951, p. 341-350.

Distribution of strains, both in the rivets and the sections of the joint, were investigated for several Al-alloy rivet compositions. Tables, diagrams, and photographs.

145 Hot Air "Welds" Plastics. Frank Charity. *American Machinist*, v. 95, Nov. 12, 1951, p. 164-165.

Thermoplastics, Pb-Bi alloys, low-melting-point solder, and other materials which melt or soften at temperatures of less than 650°F. are being joined by means of recently developed "hot-jet" equipment. The process is particularly successful in reducing the cost of plastic tooling. Diagrams and illustrations.

146* The Welding of Copper Pressure Vessels by Means of the Oxygen-Acetylene Process. F. T. Galton. *Australasian Engineer*, Oct. 8, 1951, p. 70-73.

A comparison is made of the above process, employing established practices, with further research. Lists the requirements of welding Cu, and describes a large project for welded Cu pressure vessels.

147* Brazing and Welding Copper and Aluminum for Electrical Connections. E. V. Beatson, *Engineer*, v. 192, Oct. 19, 1951, p. 501-503; Oct. 26, 1951, p. 533-536.

Describes and illustrates recommended procedures and equipment for various cases of the above. First discusses characteristics of different heating methods and brazing alloys. Then the first installment takes up torch brazing Cu to Cu; carbon resistance brazing; direct interfacial-resistance brazing; and silver-coating brazing of Cu and Cu alloys. Second and concluding installment covers Zn-coating brazing of steel to Cu, brazing of Al, properties of brazed joints in Cu, gas welding, arc weld-

ing, carbon-arc welding, inert-gas welding, spot welding, butt welding, pressure welding, and cold welding.

148* Welding With Aluminum Bronzes. E. C. Mantle. *Engineering*, v. 172, Oct. 5, 1951, p. 443-444.

The Al bronzes are a potentially useful group of filler-rod materials for making high-strength welds in Cu-base alloys. Their mechanical strength is among the highest obtainable from Cu-base alloys and they have excellent resistance to corrosion under a wide range of conditions. The presence of a strong oxide film on the surface of the metal makes gas welding with these alloys difficult, but work carried out by the British Non-Ferrous Metals Research Association shows that, if certain metallurgical factors are taken into consideration, the alloys are quite suitable for arc welding. Reports on experimental work with the 3 main types. Includes graphs and photomicrographs.

149* How New Process Bonds Aluminum and Alloys to Cast Iron, Steel and Stainless Steel. W. F. Palmer. *Industrial Gas*, v. 30, Nov. 1951, p. 5-7.

Describes the above as developed by Fairchild Engine & Airplane Corp. Process calls for extreme uniformity and accuracy of temperature control.

150 Argon Arc Welds in an Al-Mg Alloy. T. Morgan. *Light Metals*, v. 14, Nov. 1951, p. 605-613.

Gives details of recommended procedures for the above. Presents results of tensile-strength and hardness determinations on the welds.

151 Welding Unstabilized Austenitic Stainless Steels Without Carbide Precipitation. J. A. Goodford and D. W. Kaufmann. *Materials & Methods*, v. 34, Nov. 1951, p. 64-65.

Shows that rapid cooling, of the heat affected zone after welding reduces chances of subsequent intergranular corrosion.

152 Welded Aluminum Piping. D. R. Cheney. *Metal Industry*, v. 79, Nov. 23, 1951, p. 441-445.

Discusses the equipment and materials required, the effect of welding on the properties of the piping, welding techniques, and suitable applications. Data are tabulated.

153* Some Basic Ideas on Adhesion. N. A. de Bruyne. *Plastics*, v. 16, Nov. 1951, p. 308-309.

Surveys the above. Ideas on how metals are glued are included.

154* Resistance Welding and Its Application Technique. (In French.) Mario Sciaky. *Revue de la Soudure; Lastijdschrift*, v. 7, no. 3, 1951, p. 147-162.

Presents results of an investigation of various types of apparatus for the above. Various machines are described, their modes of operation indicated. Choice is determined by economic factors rather than by technical ones. Numerous tables, circuit and schematic diagrams, oscillograms, illustrations, etc.

155* Arc Welding in an Atmosphere of Argon. (In French.) A. Moreau. *Revue de la Soudure; Lastijdschrift*, v. 7, no. 3, 1951, p. 163-177.

Describes principles and technology of the process. Describes various types of apparatus for the purpose and their mode of operation. Application of this type of welding to different metals is outlined, also spot welding and welding with a consumable electrode in an atmosphere of argon. Diagrams and photographs.

156* How to Discover New Welding Processes by Systematizing the Field. (In German.) H. v. Neuenkirchen. *Schweissen und Schneiden*, v. 3, Oct. 1951, p. 311-314.

Systematically arranges the various welding processes. Gaps in the tables show new possibilities for combinations to be investigated.

157 Methods of Minimizing Cracking at Temperatures Above the Solidus During the Fusion Welding of Aluminum Alloys by the Oxyacetylene and Argon-Arc Processes. D. C. Moore. *Sheet Metal Industries*, v. 28, Nov. 1951, p. 1025-1037, 1040.

The theoretical treatment of Pumphrey and Jennings has been utilized for the development of practical methods for the above. Details of experiments are charted, tabulated, and discussed. 18 ref.

158* High Frequency Apparatus for Starting and Maintaining an Arc. (In French.) M. Moneyron. *Soudure et Techniques connexes*, v. 5, Sept.-Oct. 1951, p. 217-220; disc., p. 220-221.

It is known that the permanent pilot spark connected to welding apparatus is often the cause of radio interference. Describes and diagrams an improved method to lessen these disturbances.

159* Quality Problems in the Submerged-Arc Welding Process. (In German.) Max Komers. *Stahl und Eisen*, v. 71, Nov. 8, 1951, p. 1225-1232.

Describes development, applications, and advantages of above process as compared with other welding methods for steel. Considers types of welding fluxes, their compositions, and efficiencies; Mn losses with different powder types; structure and joint shape in 2-layer and multiple-layer welding. Notched-bar impact strength, ultimate strength, and structure of the welds after different heat treatments were studied. Effects of P and S segregations on crack development in the welds, also nondestructive testing of the welds, are discussed.

160 Metal Bonding Makes Strong, Smooth Assemblies. Gerald Eldridge Stedman. *Steel*, v. 129, Dec. 17, 1951, p. 90-93.

Describes the attachment of thin Mg skins to doublers and reinforcing members by an adhesive bonding process that avoids attachment blemish and gives a smooth exterior surface on locations like trailing edges in airplanes. It eliminates rivet patterns outside of attachment areas and provides excellent resistance to fatigue in areas subject to vibration.

161 Large Flat-Face Cathode-Ray Tubes for Radar. C. S. Szegho. *Tele-Tech*, v. 10, Dec. 1951, p. 52-53, 94.

Describes how glass-to-metal sealing techniques developed for TV now being applied to manufacture of tubes providing larger direct-view, radar displays. Flat faces permit plotting or superimposing information such as markers or maps.

162* Seam Welding of Monel Metal. Ernest F. Nippes and Gerald M. Slaughter. *Welding Journal*, v. 30, Nov. 1951, p. 537s-544s.

Presents results of an investigation to determine the optimum conditions for seam welding of Monel sheet 0.010-0.062 in. thick. Satisfactory seam welds require no porosity in the nugget, good penetration, sufficient overlap, and wide current range. Data are tabulated and graphed. Photomicrographs.

163* Nested Electrodes for Metal-Arc Welding. William A. Snyder. *Welding Journal*, v. 30, Nov. 1951, p. 557s-564s.

Describes the above which consists of two or more filler metal rods nested together but insulated from each other except at the end where they are gripped by the electrode holder; at this point they are connected to each other or to a common source of current.

164* Pressure Welding. Part III. Hot-Pressure Welding. Frank S. Gardner. *Welding Journal*, v. 30, Nov. 1951, p. 995-1003.

Presents a historical review of hot-pressure welding, classification of welding processes, precautions, procedures, design, quality control and special applications to Al and its alloys. Tables, graphs, and illustrations. 14 ref.

165* Welding Fixtures for Use With Submerged Arc. John Berkeley. *Welding Journal*, v. 30, Nov. 1951, p. 977-985.

Shows that successful use of automatic welding requires efficient deposition of flux, disposal of the slag, recovery of unfused material, adequate backing, and suitable fixtures for the techniques employed. Types of machines used for circumferential seams and for longitudinal seams are described and illustrated.

166* The Inert-Arc Welding of Thin-Walled Tubing. R. S. Zeno and H. L. C. Leslie. *Welding Journal*, v. 30, Nov. 1951, p. 986-992.

Describes techniques for inert-arc welding of thin-walled tubing made of stainless steel, mild-steel, nickel, titanium, molybdenum, and Fernico. Diagrams and illustrations.

167* Resistance Variations During Spot Welding. W. L. Roberts. *Welding Journal*, v. 30, Nov. 1951, p. 1004-1019.

Presents a survey of resistance variations in the formation of

7. *Metals–Welding or Joining*

spot welds in low-carbon steel, stainless steel, and aluminum 3S alloy including the electrical conduction of various contacts and methods for the measurement of resistance. Tables, graphs, and diagrams.

168 The E. S. S. Welding Process. (Concluded.) H. O. Willrich. *Welding and Metal Fabrication*, v. 19, Nov. 1951, p. 435-437, 441.

Concludes description of above German arc-welding process. Includes graphs, tables, and diagrams.

See also:
71 (welding repair of foundry chaplets)
228 (welding in TV picture-tube fabrication)
519 (weld deposition of new carbides)
521 (welding of Al for cable sheathing)

8. METALS—THERMAL TREATMENT

169* Comparative Study of Thermal Treatments of Steel and Their Definitions. (In Portuguese.) Werner Grundig. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 283-320.

Taking as a basis microstructures met in heat treated steel, the author attempts to define various heat-treatment processes, describing the formation and characteristic microstructures encountered. Includes charts. 14 ref.

170 Heat Treatment of Metals. Part II. Carroll B. Mershon. *Industrial Heating*, v. 18, Nov. 1951, p. 2002, 2004, 2006.

Further special operations are discussed, including austempering (interrupted quenching), carburizing, nitriding, and flame hardening of metals. Equipment for fuel-fired furnaces is also considered as well as furnace atmospheres and agents, and temperature measurement.

171 Flame Hardening Proves Versatile Heat Treating Method. Stephen Smith. *Iron Age*, v. 168, Nov. 22, 1951, p. 96-98.

Describes how close control of surface hardening and depth of hardness are possible with the flame hardening set-up at National Forge & Ordnance Co. Large or small areas are surface hardened with equal facility and less expense than with other comparable means. Data are graphed. Illustrations.

172 Stamps, Dies and Punches; Treatment and Metallurgical Control at Edward Pryor & Son, Ltd. *Iron and Steel*, v. 24, Nov. 1951, p. 523-526.

Describes methods used in the above. Shows how strict metallurgical control maintains high mechanical properties and dimensional accuracy. Diagrams and micrographs.

173 Heat Treating the Carburizing Grades of Boron Steels. Kenneth Rose. *Materials & Methods*, v. 34, Nov. 1951, p. 66-68.

Avoiding excessive core hardenability and obtaining satisfactory case hardness in large section parts are major problems in the above. Describes recommended procedures. Experiences of several companies are briefly described.

174* Heat Treatment and Pickling of the Stainless Steels. Lester F. Spencer. *Magazine of Tooling and Production*, v. 17, Dec. 1951, p. 52-55, 72, 76.

An illustrated survey. Includes tabular data.

175 The Surface Hardening of Steel. Part X. Cyaniding Practice. G. T. Colegate. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 507-514.

Discusses the influence of bath compositions and treatment after cyaniding on the properties of the case formed. Specialized processes, including Chapmanizing, dry cyaniding, and the Nicarb process are also described. (To be continued.)

176* Investigation on the Suitability of Steel and Cast Iron for Case Hardening by High Frequency Currents. (In Polish.) F. Staub and K. Pogorecki. *Prace Glównego Instytutu Metalurgii*, v. 3, no. 5, 1951, p. 375-387.

Results of investigations on the case hardening of steel, steel castings, and cast iron by induction heating with high-frequency currents are presented. Effect of surface temperature on hardness of the surface layer, as well as effect of heating on depth of hardening, are discussed.

177* On Austenitic Malleable Cast Iron. (Report 1.) Nobuhisa Tsutsumi. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 42-45.

Describes research directed toward getting blackheart malleable cast iron by one-stage annealing. Tensile strength and hardness values of this cast iron are discussed. Data are tabulated.

178* Study of the Thermal Treatment of Duralumin. (In French.) Pierre Laurent and Henri Jarlan. *Revue de Métallurgie*, v. 48, Oct. 1951, p. 759-764.

The influence of rate and temperature of hardening heat treatment on the hardness of a treated duralumin was studied. Includes graphs.

179* Recommended Heating and Holding Times in the Practical Annealing and Heat Treatment of Steels. (In German.) Walter Hülsbruch. *Stahl und Eisen*, v. 71, Nov. 8, 1951, p. 1219-1225.

The above were investigated for 5 low-alloy steels. Effects on grain size and toughness were determined. 28 ref.

Miscellaneous Publications

180 Effects of Some Solution Treatments Followed by an Aging Treatment on the Life of Small Cast Gas-Turbine Blades of a Cobalt-Chromium-Base Alloy. II. Effect of Selected Combinations of Soaking Time, Temperature, and Cooling Rate. C. A. Hoffman and C. F. Robards. National Advisory Committee for Aeronautics, Technical Note 2513, Oct. 1951, 19 pages. (TL570 Un3t)

Above were investigated for Haynes Stellite alloy 21. Six heat treatments were studied. The treatments were followed in each case by aging at 1500°F. for 72 hrs. 20 blades taken from each of the 6 heat-treated groups, together with 22 as-cast blades, were assembled in a small gas turbine. Results are charted, tabulated, and illustrated by photomicrographs.

See also:
65 (annealing of blackheart malleable cast iron)
113 (stretch forming with and without heat treatment)
120 (heat treatment of Al alloys)
125 (thermal stress relief of Si-Cu hemispheres)
221 (heat treatment of Be-Cu alloys)
346 (low temperatures vs. mechanical properties of metals)
347 (heat treatment of pressure-vessel steels)

9. CLEANING, FINISHING, AND COATINGS—METALLIC

181* Observations Relative to the Metallization of Surfaces by Evaporation in a Vacuum. (In French.) Louis Dunoyer. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 919-921.

Discusses the above with respect to the treatment to which it is advisable to submit the surface in the vacuum before metallization, to the choice of metal constituting the heating device, and to the treatment which makes it possible to increase considerably the hardness of the deposited metallic layer.

182 Pure-Iron-Plating Process. *American Machinist*, v. 95, Dec. 10, 1951, p. 197.

Discusses advantages and applications of the Vanderloy-M plating process developed by Van der Horst Corp. Renews cylinder liners, crankshafts, etc.

183* Surface Finish. R. E. Reason. *Australasian Engineer*, Oct. 8, 1951, p. 48-59; disc., p. 59-64.

Various methods of measuring surface finish and various instruments used for the purpose are reviewed. Numerical assessment of the surface is discussed. Ease and accuracy of instrumentation for each method is considered. Diagrams and illustrations. 15 ref.

184* Metal Plating on Plastics. *Bakelite Review*, v. 23, Oct. 1951, p. 10-11.

Describes a new and economical method of plating metal on phenolic, styrene and vinyl plastics which makes possible lightweight, corrosion-resistant products with hard, high-polish metal surfaces.

185* Government Specifications for Porcelain Enamels. W. N. Harrison. *Better Enameling*, v. 22, Nov. 1951, p. 32-36.

Surveys the above. Data are tabulated.

186 Iron Plating Cheats the Scrap Pile. *Business Week*, Dec. 1, 1951, p. 108-110.

Describes a new method of plating pure iron to any desired thickness on steel. Called "Vanderloy M," the process replaces worn-off metal.

187 The Abrasion Resistance of Sulphuric Acid Anodic Films on Aluminum and Its Alloys. R. C. Spooner. *Canadian Journal of Technology*, v. 29, Nov. 1951, p. 479-491.

Discusses the abrasion value of anodic coatings produced on Al alloys. Effect on the abrasion value of 5 process variables; anodizing time, sealing time, air aging, current density, and electrolyte temperature, was determined. 13 ref.

188 Fishscale Susceptibility of Enamel-Steel Systems. Donald C. Bowman. *Ceramic Industry*, v. 57, Dec. 1951, p. 70-73, 116.

Describes preliminary investigation of a method of accelerating the formation of fishscale to study the defect, in porcelain-enameled steel. Points out ways in which the defect can be minimized or avoided. Photomicrographs of enamel-steel interface.

189 Conservation of Zinc; Economies in Hot-Dip Galvanizing. *Chemical Age*, v. 65, Nov. 3, 1951, p. 599-602.

Surveys work on the above done by British Non-Ferrous Metals Research Assn.

190* The Polishing of Silverware & Jewelry. G. E. Gardam. *Electroplating and Metal Finishing*, v. 4, Oct. 1951, p. 303-305, 312.

Describes mechanical finishing procedures for the above.

191* Solution Control in the Electroplating Trade. K. E. Langford. *Electroplating and Metal Finishing*, v. 4, Nov. 1951, p. 338-339. (Excerpts from "Analysis of Electroplating and Related Solutions," to be published in book form.)

Discusses the theory and limitations of the use of both fluorides and silico-fluorides in barrel Cr-plating solutions. Mentions an electrochemical method for the determination of sulfate in Cr-plating solutions.

192* Rochelle Copper Plating With Air Agitation. Bernard C. Lewsey. *Electroplating and Metal Finishing*, v. 4, Nov. 1951, p. 341-343.

Describes above technique developed for obtaining dense lustrous deposits on the wide variety of work which the jobbing plater is called upon to undertake. Vigorous air agitation is essential and does not cause excessive carbonation.

193* Abrasive Liquid Blasting. N. I. Gorayetski. *Engineers' Digest*, v. 12, Nov. 1951, p. 365-368. (Translated from *Stanki i Instrument*, v. 22, no. 7, 1951, p. 27-31.)

Describes experimental work on metal removal by blasting with an abrasive liquid and equipment for directing the abrasive jet onto the treated surface. Discusses the influence of individual factors on this process.

194* The Role of Carbon in the Formation of Thin Film Deposits. O. Goche, F. Boullon, and A. Frére. *Engineers' Digest*, v. 12, Nov. 1951, p. 375-377. (Translated from *Bulletin de la Classe des Sciences, Academie royale de Belgique*, ser. 5, v. 36, 1950, p. 330-339.)

A study of the above to determine the general validity of the corresponding mechanism for other elements or compounds. Experiments and results obtained on cathodic atomization of Ag, Cu, and Zn are described.

195 The Technical Details of Low Pressure Spraying. Roy D. Beck. *Finish*, v. 8, Dec. 1951, p. 25-28, 65-66.

Surveys the above discussing: expendable materials, product and its design, supervision and personnel, equipment, process technique, production and advantages, and conclusions. Data are tabulated.

196* Metallizing Glass. Elmar Umblia. *Glass*, v. 28, Oct. 1951, p. 343-351. (Translated from *Glasteknisk Tidskrift*, v. 5, no. 6, 1950.)

Presents comprehensive description of procedures and applications for the above. Characteristics of the different metals used in the process are described. 19 ref.

197 Lead: Cladding Adds New Uses. *Iron Age*, v. 168, Dec. 6, 1951, p. 114.

Briefly describes a new process of lead cladding Cu and steel. Uses whenever H_2SO_4 creates a corrosion problem are discussed.

198 Production Experience Proves Diaphragm Plating. R. L. Redmond. *Iron Age*, v. 168, Dec. 13, 1951, p. 132-133.

Describes how by directing plating solution flow from the cathode through a fabric diaphragm to the work being plated, surface pits, bumps, and polarization are minimized. Also, experiences show that circulation of solution and filtration are improved.

199 Electroforming Solves Special Production Problems, John Kolb. *Iron Age*, v. 168, Dec. 6, 1951, p. 151-153.

Discusses the above in overcoming such difficulties as extra-sharp corners and points, intricate contours, and especially tight tolerances. The process is equally adaptable to experimental or large-scale production, it can be used to turn out, first, experimental pieces and, later, production parts. Emphasis is on Cu and Ni.

200 Mechanism and Kineties of the Chromizing of Mild Steel in Atmospheres Containing Chromous Chloride. T. P. Hoar and E. A. G. Croom. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 101-107.

Shows experimentally that 0.1%-C mild steel exposed to atmospheres containing chromous chloride at 950-1100°C. becomes coated with a Cr-rich layer. The overall rate of chromizing is limited, in the early stages, by the rates of the reactions; and, in the later stages, by the rate of metallic interdiffusion in the growing alloy layer. Various practical chromizing processes are discussed in the light of the experimental results. 17 ref.

201 Electrochemical Studies of Protective Coatings on Metals. Part III. The Correlation Between Conductance or Capacitance and Area of Breakdown of Paint on Steel Immersed in Sea Water. F. Wormwell and D. M. Brasher. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 228-234.

The relationship between the area of metal exposed at breaks in the paint film and measured conductance or capacitance was studied critically. Data are tabulated.

202 Surface Effect in the Cleavage of Zinc Monocrystals. John J. Gilman. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1148-1149.

Recently it has been observed that certain normally ductile Zn monocrystals become extremely brittle when their surfaces are coated with Cu oxide or Plate. Etching away the oxide layer made the crystal ductile again. Details of the phenomenon are described and possible mechanisms discussed.

203 De-Enameling Process Economically Reclaims Defective Enameled Ware. Kenneth Rose. *Materials & Methods*, v. 34, Nov. 1951, p. 80-81.

Tells how, by stripping off imperfect vitreous finishes in a strong alkali bath, shaped iron and steel pieces can be salvaged for refinishing with consequent savings in cost and scrap.

204* Dragout Control. Part II. Joseph B. Kushner. *Metal Finishing*, v. 49, Dec. 1951, p. 58-61, 67.

Continues a previous discussion on physical properties of plating solutions. Geometry of the object to be plated is considered in detail. (To be continued.)

205* Electrodeposition of Nickel in the Bores of Tubes Using Insoluble Anodes. A. W. Hothersall and G. E. Gardam. *Metal Finishing*, v. 49, Dec. 1951, p. 65, 69. (A condensation.)

Tells how smooth deposits of Ni having good mechanical properties may be built up to a considerable thickness on the bores of tubes by the use of an insoluble anode which is made of or coated with lead. Details of recommended procedures are given.

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206* Electrodeposition on Aluminum; A Study of the Zincate Process. G. L. J. Bailey. *Metal Finishing*, v. 49, Dec. 1951, p. 66-67.

Presents results of an investigation on the above. Influence of alloy composition and conditions of heat treatment upon adhesion are discussed. A theory of the mechanism of adhesion for the zincate process is given.

207* Silver Plating With Insoluble Anodes. Walter R. Binai. *Metal Finishing*, v. 49, Dec. 1951, p. 68-69.

Surveys requirements for the above. Advantages of plating with insoluble anodes are described.

208* "Interior Surfaces" in Hot Galvanizing. (In German.) H. Bablik. *Metall*, v. 5, Nov. 1951, p. 479-480.

Summarizes papers published by author and associates concerning "inner surfaces" which are created during hot galvanizing. Proposes general law for the creation and consequences of enlarged surface areas or pores.

209 The Production of Relief Designs on Aluminum Surfaces by Anodic Oxidation. G. O. Taylor. *Metallurgia*, v. 44, Oct. 1951, p. 243-244.

Describes a method for the above based on the intensely hard anodic film produced by anodizing in H_2SO_4 under suitable conditions. The process is capable of a number of variations whereby an interesting range of decorative finishes is possible.

210 Cleaning of Stainless Steel. (In French.) G. Rossi-Landi. *Métallurgie et al Construction mécanique*, v. 83, Oct. 1951, p. 763, 765.

Briefly reviews progress made on the above problem using various chemical procedures.

211 The Protection of Metallic Surfaces by Chromium Diffusion. Part IV. Modern Chromising Methods. R. L. Samuel and N. A. Lockington. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 495-502, 506.

Details are given of chromizing methods developed since 1938. Of these, two, the D.A.L. and B.D.S. processes, which employ pack-chromizing techniques, have proved to be the most practicable and are in commercial use today. (To be continued.)

212 Cleaning Metal Parts With Red Garnet Sand. Ira S. Roberts. *Modern Machine Shop*, v. 24, Dec. 1951, p. 214, 216.

Describes the above. Merits of red garnet sand are compared with silica sand.

213* Research on Electrodeposition At the National Bureau of Standards. William Blum. *Technical News Bulletin* (National Bureau of Standards), v. 35, Dec. 1951, p. 180-185.

Surveys the above. Developments in chromium plating and nickel deposition are outlined. Studies on the principles of electrodeposition are included. Future work in this field is mentioned.

214 Structure of Amorphous Aluminum Oxide Films. *Nature*, v. 168, Oct. 6, 1951, p. 600-601.

Results of investigation of the above are briefly presented. Refers to the oxide layer formed on Al by atmospheric oxidation.

215 Measuring Adhesion of Organic Coatings. Fred M. Burt. *Organic Finishing*, v. 12, Nov. 1951, p. 14-15.

Described the Adherometer, developed in the research laboratories of the Interchemical Corp., and designed to measure the stripping force required to remove a paint film from the surface of a metal test panel.

216 Liquid Stainless Steel. A. L. Phillips. *Organic Finishing*, v. 12, Nov. 1951, p. 16-18.

The above is a combination of actual stainless steel reduced by a new process to a microscopically fine form and combined with vinyl plastic to form a quick-drying liquid that will give a protective coating of actual stainless steel. Applications are given.

217 Electroplating of Gold Alloys. Edward A. Parker, *Plating*, v. 38, Nov. 1951, p. 1134-1140, 1156; Dec. 1951, p. 1256-1259.

Discusses above for use in jewelry and decorative plating from two viewpoints, namely, physical factors and color of the alloy plate. Physical factors which affect color and composition of Au-alloy plates are dealt with in this installment. They are agitation, current density, temperature, concentration, free cyanide, pH, other salts, aging, impurities, surface finish, and anodes. In the 2nd installment, Au-alloy solutions are discussed from the viewpoints of color. (To be continued.)

218 Barrel Finishing. I. Some Fundamentals. Morris S. Shipley. *Plating*, v. 38, Dec. 1951, p. 1240-1242, 1260-1261.

Describes the variables to be considered in the above. Applications are given.

219 Nickel Plating With Insoluble Anodes. W. A. Wesley, D. S. Carr, and E. J. Roehl. *Plating*, v. 38, Dec. 1951, p. 1243-1250; disc., p. 1250, 1255.

Describes an electrolytic replenishing method devised for maintaining the Ni content and pH of a chloride-free Ni-plating bath which is concurrently being depleted by Ni plating with insoluble anodes. A disadvantage of this process is that gases are copiously liberated at the various electrodes and cause considerable spray. Data are tabulated and graphed. 10 ref.

220 Cleaning and Preparation of Metals for Electroplating. IV. Degreasing Evaluation Test: Sequential Testing. Henry B. Linford and Edw. B. Saubestre. *Plating*, v. 38, Dec. 1951, p. 1263-1266.

A number of degreasing-evaluation tests were studied, along with the newly developed atomizer test. The atomizer test was found to be the most sensitive, followed by the fluorescent-dye test. The spray-pattern, potassium ferricyanide paper, and copper sulfate-dip tests were found considerably less sensitive. Data are tabulated.

221* Pickling and Electroplating Beryllium-Copper Alloy Components. *Products Finishing*, v. 16, Nov. 1951, p. 22-24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48.

A study of the corrodibility of the Be-Cu alloys was made. Heat treatment and surface conditions in preparation for the above operations are described. Data are tabulated.

222* Cleaning With Sound Waves. John Starr. *Products Finishing*, v. 16, Nov. 1951, p. 52-54, 56, 58.

Discusses magnetostrictive and electrostrictive generators. Factors to be considered in the selection of cleaning solutions are presented. 13 ref.

223* Highlights of the American Electroplaters' Society's Research Program. Donald Price. *Products Finishing*, v. 16, Nov. 1951, p. 88, 90, 92, 94, 96, 98.

Surveys the above. A brief summary of various projects is given.

224* Electrolytic Polishing and Anodic Oxidation of Aluminum; Their Study by Electron Diffraction. (In French.) M. Halfawy. *Revue de Métallurgie*, v. 48, Oct. 1951, p. 787-792.

Reports some results of experiments carried out on the above. Includes graphs and photomicrographs. 15 ref.

225* Improving Efficiency in Bright-Drawn Steel-Bar Pickling Plants. (In German.) Friedrich von der Heide. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1148-1154; disc., p. 1154-1155.

Describes pickling processes and reactions. Discusses possibilities of conservation of acids, pickling time, and materials. Effects of acid concentration, temperature, and nature of scale on pickling time for various steels were investigated. Data are charted.

226 Magnetic Device Improves Continuity of Pickling Line Operations. W. W. Palmer. *Steel*, v. 129, Dec. 3, 1951, p. 96, 98, 100, 102, 105, 108.

Describes and diagrams magnetic loop control which allows strip to be run closer to bottom of tank, affords longer path through acid, and permits increased strip speeds. Cleaning line equipped with new control increased output from 400 to 580 tons per turn.

227 Differential Coating Process Saves Tin. J. J. Munns. *Steel*, v. 129, Dec. 17, 1951, p. 102, 104.

Describes how different weight of coating on each side of

sheet provides stock for containers with inside surface capable of resisting attack of product and outside surface of withstanding atmospheric conditions.

228* TV Picture Tubes With Iron Envelopes. C. S. Szegho and R. G. Pohl. *Tele-Vision Engineering*, v. 2, Nov. 1951, p. 8-9, 26-27.

Describes manufacturing techniques developed for the fabrication of tubes which feature envelopes with chromium-iron sealing beads and all-iron cones. The cone is first glazed with vitreous enamel and then joined to the metal by an arc-welding process.

229* The Theory and Practice of Hot-Dip Tinning; Application to Wire Processing. W. E. Hoare. *Wire Industry*, v. 18, Oct. 1951, p. 867-870, 873-875; Nov. 1951, p. 969-971.

Details of the above are clarified by numerous graphs, diagrams and illustrations. Covers tinning of copper as well as iron and steel.

See also:
174 (pickling of stainless steels)
277 (electrochemistry in metal finishing)
526 (coatings on Al nameplates)

10. METALLOGRAPHY AND PRIMARY STRUCTURES

230* Use of Colored Films to Study Changes in Micrographic Structure of Type 80/20 Refractory Nickel-Chromium Alloys. (In French.) Charlotte Bückle and Jean Pouligner. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 15, 1951, p. 869-871.

Describes use of colored films formed on the surfaces of above alloys on attack by a boiling solution of 5 cc. conc. HF, 3 cc. conc. HCl, and 50 cc. ethyl alcohol, to study structure changes due to aging for various times and temperatures.

231 Crystallographic Angles for Tin. J. F. Nicholas. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1142.

Results of precise calculations are tabulated.

232 Analytical Representation of Certain Phase Boundaries. W. Rostoker. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1203-1205.

Using an expression for the free energy of a homogeneous phase as a function of composition, a relationship is derived which interrelates the phase boundaries extending from the allotropic transformation of the solvent metal. Comparisons between observed and calculated phase boundaries in the system Fe-Ni, Fe-Mn, Fe-Mo, and Ti-Cb are presented.

233 Constitution of Titanium-Aluminum Alloys. H. R. Ogden, D. J. Maykuth, W. L. Finlay, and R. I. Jaffee. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1150-1155.

Al was found to be soluble in α-Ti to about 26% and to raise the temperature range of transformation from α to β. Two intermediate phases exist in the system, a new face-centered tetrogonal phase, designated as γ, which occurs between 34 and 46% Al, and $TiAl_3$. Metallographic and X-ray diffraction data were used to determine the diagram. Photomicrographs, tables, and graphs.

234 Useful Etchants for Electron Metallography. William L. Grube. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1171-1173.

Discusses the relative merits of various types. Comparative photomicrographs at 5000x show results obtained with different etchants on different phases of steel and on cemented carbides and Vitallium.

235* Structure Investigations in the Aluminum Corner of the Aluminum-Iron-Silicon System. (In German.) L. Holik, H. Nowotny, and W. Thury. *Berg und Hüttenmännische Monatshefte der Montanistischen Hoshschule in Leoben*, v. 96, Sept. 1951, p. 181-184.

Photomicrographs and graphs supplement brief discussion of above. 12 ref.

236* Summarized Proceedings of Conference on Metals, Leamington Spa, April 1951. *British Journal of Applied Physics*, v. 2, Nov. 1951, p. 305-318.

Presents a summary of 18 papers on the texture and structure of metals presented at a conference of the Institute of Physics held at Ashorne Hill, Leamington Spa, April 12-13, 1951. 95 ref.

237 Uranium Sesquicarbide. M. W. Mallett, A. F. Gerds, and D. A. Vaughan. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 505-509.

Describes preparation and properties of the above. It was found that U_2C_3 can be formed from a mixture of UC and UC_2. Crystal structure was found to be body-centered cubic. Micrographs.

238 The Alloys of Molybdenum and Tantalum. G. A. Geach and D. Summers-Smith. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 143-146.

Investigation of the system Mo-Ta showed that these metals form a continuous series of solid solutions. No superlattice was detected and no anomalies occur between true and X-ray densities. Approximate melting points of the alloys were also determined. Alloys of the transition metals of Groups IV-A, V-A, and VI-A with each other are discussed briefly. 16 ref.

239 A Simple Reflecting Microscope for High-Temperature Metallography. D. W. Dewhirst and M. J. Olney. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 221-227.

Presents a detailed description of design, construction, and adjustment of a simple reflecting microscope with a bi-spherical monocentric objective of 0.5 N.A. and 17 mm. working distance with information on photographic techniques. A complete apparatus for the examination of specimens in vacuo at temperatures up to 1000°C., and some typical results obtained by its use, are described. 37 ref.

240* The Cast Iron-Steel Limiting Alloy. (In Italian.) Giordano Bruni. *Metallurgia Italiana*, v. 43, Oct. 1951, p. 435-438.

Shows that there are two fundamental types of saturated austenite. One contai · $Fe_{12}C$ and the other $Fe_{18}C$. Discusses phase relationships involved. 20 ref.

241 Structure of $Cu_{32}Al_{19}$. A. J. Bradley. *Nature*, v. 168, Oct. 13, 1951, p. 661.

Describes the above. Electrons are grouped such that the structure remains electrically neutral at every point.

242* A New Surface Structure of "Stretched" Aluminum. (In German.) Heinz Wilsdorf and Doris Kuhlmann-Wilsdorf. *Naturwissenschaften*, v. 38, 1st Nov. no., 1951, p. 502.

Shows briefly that the replica process is a preferred method of electron microscopy for showing the slip planes of elongated Al. Includes electron micrographs.

243* The Technique of Microradiography by Absorption and Some Examples of Application of This Method to Metallographical Investigations. (In Polish.) Z. Bojarski. *Prace Glównego Instytutu Metalurgii*, v. 3, no. 5, 1951, p. 417-428.

A theoretical approach to the methods used in microradiography and possibility of application of these methods to practical problems are explained. The microradiographic absorption method is developed. Gives practical instructions for preparation of target elements and selection of wave-length of radiation and voltage. 12 ref.

244 The Diffraction Pattern of Cold Worked Metals: I. The Nature of Extinction. II. Changes in Integrated Intensity. W. H. Hall and G. K. Williamson. *Proceedings of the Physical Society*, v. 64, sec. B, Nov. 1, 1951, p. 937-953.

Part I shows how experimental results for chemically produced Cu and annealed Al filings were obtained with a Geiger-counter spectrometer using monochromatic radiation. Evidence to show that annealed metals contain residual lattice strain is advanced, in accord with dislocation theory. In Part II, measurements were made, using a Geiger counter spectrometer, of the changes

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produced by cold work on the integrated intensities in the Debye-Scherrer spectrum of Al. 33 ref.

245 Photomicrography in Colour by Reflected Light With Special Reference to Metals. K. J. B. Wolfe. *Photographic Journal*, v. 91B, Sept.-Oct. 1951, p. 94-98.

Normal methods used for the preparation of metallic specimens for micro-examination are described together with the salient features of the metallurgical microscope or metallograph. The application of plane polarized light for the identification of non-metallic inclusions, together with certain improvements and developments, is mentioned. Using the Vickers projection microscope, methods are described for production of transparencies of Kodachrome and Dufaycolor. Descriptions of the methods used for making paper prints by the Autotype "Trichrome Carbo" and the Kodak "Dye Transfer" processes are given. An alternative method available in the U. S. is also described. 16 ref.

246* Contribution to the Study of the Iron-Phosphorus Diagram. Study of the Testing of Phosphide Grains. (In French.) P. Roquet and G. Jegaden. *Revue de Métallurgie*, v. 48, Sept. 1951, p. 712-721; Oct. 1951, p. 793-810.

Presents details of comprehensive experimental study of the above. This first part is concerned with the gamma-phase section of the diagram for Bessemer steels and for P contents between 0.05 and 0.3%. The 2nd part is concerned with the structure of ingots and plates. It makes it possible to fix optimum conditions of casting and of forging. Graphs, tables, phase diagrams, and photomicrographs. 19 ref.

247* Some Examples of the Application of Semi-Microradiography to the Examination of Cast Aluminum Alloys. (In French.) A. Lahodny and F. Nonveiller. *Revue de Métallurgie*, v. 48, Oct. 1951, p. 778-786; disc., p. 786.

Describes laboratory tests on Al-Cu-Mg billets produced by ingot and continuous castings. Shows that semi-microradiography can be useful for examining the crystallization process of light alloys if they contain constituents which absorb X-rays differently, and for examining large specimens. Illustrated. 10 ref.

248 Metallography of Alloys of Titanium With Oxygen, Carbon and Nitrogen. Thomas Redden and Mary Jane Field. *Steel*, v. 129, Nov. 19, 1951, p. 88-90.

Presents results of tensile strength, elongation, and hardness tests on above alloys, also results of micro-structural examination.

249* Statement on the Occurrence of Graphitization in Carbon Steel on Stainless-Clad Vessels. *Welding Journal*, v. 30, Nov. 1951, p. 544s-545s.

Discusses the above in the service life of petroleum refineries. Stresses caused by the cladding may be responsible. Aspects of future research are discussed.

See also:

32 (internal structure of killed steel)
58 (macrostructure of density-controlled steel)
114 (steels and cast irons—microstructure vs. tool life)
159 (P and S inclusions in weld metal)
169 (steels—heat treatment vs. microstructure)
252 (structure of nodular cast iron)
324 (structural changes during creep of Al)
341 (microstructures of Al-Zn-Mg alloys)
343 (microstructure of steel vs. creep strength)
344 (WC-Co alloys)
638 (theory of bearing-metal structure)
925 (Brillouin zones in cubic lattices)

11. METALS—TRANSFORMATIONS AND RESULTING STRUCTURES

250 Formation of Annealing Twins During Grain Growth. R. L. Fullman and J. C. Fisher. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1350-1355.

It is proposed that annealing twins form during grain growth as a result of a decrease in the interfacial free energy of grain boundaries that would not occur in the absence of twinning. Experiments designed to permit detection of the changes in grain-boundary free energy accompanying the formation of twins give results in agreement with this concept. The abundance of twins found in annealed Cu depends on the texture in a manner that is consistent with the theory. 11 ref.

251* A Theory of Globular Graphite Formation in Cast Iron. Ichiro Iitaka. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 1-4.

Considering the crystalline nature of graphite on one side, and the process of solidification of cast iron on another side, a hypothesis to explain nodular graphite formation is proposed. The experimental facts hitherto observed by other authors were explained by this hypothesis. Photomicrographs. 12 ref.

252* Spheroidal Graphite Cast Iron. (Report 1.) Takaji Kusakawa, Rikuro Kanda, and Masahiro Kanie. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 25-32.

Discusses characteristics found in the structure of the above. The amount of Mg addition and the effect of section size, i.e. the rate of cooling, are the main factors to explain the mechanism of spheroidal-graphite formation and the process in the foundry. Photomicrographs.

253* Evolving Gases on Solidification of Molten Cast Iron. (Report 2.) Miano Nakano. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 46-49.

Gases evolved during solidification of Penhsihu pig iron melted by various methods were collected and analyzed. The connection between graphitization and compositions of evolved gases was also studied. Data are tabulated and graphed.

254 Discussion on the Paper—"The Transformations $\alpha \rightarrow \gamma$ and $\gamma \rightarrow \alpha$ in Iron-Rich Binary Iron-Nickel Alloys," N. P. Allen and C. C. Earley. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 127-129.

Paper published in v. 166, Dec. 1950, p. 281-288.

255 Joint Discussion on the Papers—"The Acceleration of the Rate of Isothermal Transformation;" and "The Breakdown of Austenite Below the M_s Temperature," F. C. Thompson and M. D. Jepson. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 129-133.

Papers published in v. 162, 1949, p. 49-56; and v. 164, 1950, p. 27-35.

256 Discussion on the Atlas of Isothermal Transformation Diagrams of B. S. EN Steels. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 137-144.

Deals with *Iron and Steel Institute*, Special Report 40, 1949.

257 Model for Dendrite vth Form in Metals and Alloys. R. B. Pond and S sler. *Journal of Metals*, v. 3, Dec. 1951; *Transactions merican Institute of Mining and Metallurgical Engine* 191, 1951, p. 1156-1162.

Several pure-metal specimens were solidified through a measured thermal gradient so a free surface and the liquid-solid interface could be examined. A line structure was observed on the surface and a hexagonal structure on the interface. A model to explain these forms is proposed. Metals studied were Pb, Sn, Al, and In.

258 Eutectoid Decomposition of the Delta Phase of the Copper-Tin System. C. C. Wang and M. Hansen. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1212.

Longtime annealings at 300°C. were conducted with alloys containing 22, 32.6, and 35% Sn prepared from electrolytic Cu and electrolytic Sn and cast in a small iron mold. Microstructures are illustrated and discussed.

259 Transformation of Low-Carbon, 12% Chromium Stainless Steels. A. E. Nehrenberg. *Metal Progress*, v. 60, Nov. 1951, p. 64-69.

Quantitative data were presented to show the variation in amount of delta ferrite with temperature in 12.5%-Cr stainless steels containing 0.06, 0.10, and 0.12% C. Photomicragraphs.

260 Contamination of Evaporated Films by the Supporting Material of the Source. O. S. Heavens. *Nature*, v. 168, Oct. 13, 1951, p. 664.

Describes experiments on the above in which an active Ta boat was used as evaporation source. Ag and Ge were examined, the evaporation being carried out at several temperatures.

Miscellaneous Publications

261 Crystallographic Aspects of Phase Transformations. M. J. Buerger. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 183-209; disc. p. 209-211. (QC125 N21p)

Since the structures of many of the crystalline phases involved in transformations are now well known, it is possible to discuss transformations of crystals from a structural viewpoint and to correlate profitably general thermodynamic features with specific structural characteristics. Data are graphed and tabulated. 18 ref.

262 The Eutectoid Reaction. Robert F. Mehl and Arthur Dube. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 545-582; disc., p. 582-587. (QC125 N21p)

Considers the principles which appear to govern the mechanism and the kinetics of the above. Diagrams and micrographs. 32 ref.

263 The Martensite Transformation. Morris Cohen. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 588-659; disc., p. 659-660. (QC125 N21p)

Describes general characteristics of the above. Crystallographic aspects are summarized and the thermodynamics of the reaction are described. Diagrams and graphs. 103 ref.

264 Nucleation Theory. R. Smoluchowski. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 149-180; disc. p. 180-182. (QC125 N21p)

Surveys the above. Considers such aspects as recrystallization, non-equilibrium conditions and fluctuations and embryos in equilibrium conditions. 40 ref.

265 Order-Disorder Transitions in Metal Alloys. Sidney Siegel. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 366-383; disc. p. 383-386. (QC125 Nt21p)

Discusses the above. Effects of the order-disorder transition on electrical, magnetic, and mechanical properties are described. 24 ref.

266 Precipitation From Solid Solutions of Metals. A. H. Geisler. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 387-535; disc., p. 536-544. (QC125 N21p)

Presents a comprehensive review of the mechanism of the precipitation process correlated with the changes in properties that occur during aging. The complexities attendant upon the formation of a new phase are rationalized on the basis of changes in crystal structure and in microstructure. In the discussion of changes in properties not only those which have been used to study the progress of precipitation but also those of practical importance are included. Graphs and diagrams. 830 ref.

267 Transformations in Pure Metals. Charles S. Barrett. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 343-365. (QC125 N21p)

Discusses some current theories of the above and compares them with experimental data. Analogies between transformations and related processes are brought out. 25 ref.

See also:

87 (grain refinement in Al alloys)
240 (austenite phase relationships)
269 (disintegration of 45-50% ferrosilicon)
270 (AlN precipitation in gamma-Fe)
320 (causes of high-temperature embrittlement of ferritic stainless steels)
341 (transformations of Al-Zn-Mg alloys)
734 (hysteresis in solid-state transitions)
761 (diffusion in metallic solid solutions)
948 (solid-state diffusion)

12. METALS—PHYSICAL PROPERTIES AND TESTS

268 A Radial Heat Flow Apparatus for the Determination of Thermal Conductivity. A. C. Burr. *Canadian Journal of Technology*, v. 29, Nov. 1951, p. 451-457.

Describes and discusses the above. The apparatus was designed for routine measurement of thermal conductivity of materials in the range 0.001 to 0.1 c.g.s. units, but can be modified easily for measurements on metals or on refractory materials. Accuracy is estimated to be about 5%. Data on Armco iron and petroleum coke are tabulated.

269 Disintegration of 45-50% Ferro-Silicon and the Generation of Poisonous Gases. A. K. Prestrud. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 107-109.

An experiment with ferrosilicon showed an uneven distribution of the different elements in the cast. The analytical figures are compared with data from the Fe-Si equilibrium diagram. The influence of Al on the disintegration of certain grades of ferrosilicon with evolution of phosphine is discussed, and a cause for the disintegration suggested.

270 Solubility of Gaseous Nitrogen in Gamma Iron and the Effect of Alloying Constituents—Aluminum Nitride Precipitation. L. S. Darken, R. P. Smith, and E. W. Filer. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1174-1179.

Solubility of N_2 purified Fe and low-alloy steels was determined for the γ region (930°-1350°C.). The diffusivity of N_2 is estimated from the rate of approach to equilibrium. Investigations of Al-killed steels, held in N_2, disclose precipitation of AlN, the solubility of which was determined. 12 ref.

271 Effect of Varying the Rate of Reduction on the Magnetic Properties, Ultimate Tensile Strength, and Resistivity of 18/8 Stainless Steel Wire. Samuel Storchheim. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1181-1183.

Data are tabulated, charted, and discussed.

272 Correlation Between Electrical Conductivity and Temperature Coefficient of Resistance of Solid-Solutions Alloys. M. Hansen, W. R. Johnson, and John M. Parks. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1184-1189.

As part of a research project sponsored by the Signal Corps Engineering Laboratories, which has the objective of obtaining a magnet wire of good conductivity and low temperature coefficient of resistance, a comprehensive literature survey, supplimented by experimental work, revealed that a linear relationship exists for solid-solution alloys between the electrical conductivity and temperature coefficient. Data for Cu solid-solution alloys with P, Si, As, Sb, Al, Ni, Mn, Fe, Mg, Co, and Ti are charted, tabulated and correlated. 21 ref.

273 Rate of Evaporation of Zinc at Low Pressures. H. W. St. Clair and M. J. Spendlove. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1192-1197.

Describes and diagrams automatic surface-follower mechanism used to measure the surface temperature and rate of evaporation of molten Zn while undergoing distillation at low pressure. At pressures of 50-100 microns Hg, rate of evaporation may be 60-80% of the theoretical maximum corresponding to the measured temperature. The rate decreases rapidly at pressures above 100 microns Hg. Measured temperature gradients at the surface are in agreement with theoretical gradients calculated from heat of vaporization, rate of evaporation, and thermal conductivity of molten Zn.

274 Vapor Pressures of Zinc Over AgZn Alloys. E. E. Underwood and B. L. Averbach. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1198-1202.

Above were measured by the dew-point method. The thermodynamic activities of silver, and the molar heats of formation, were calculated. Similar measurements were made for the ternary alloys formed by adding Au to AgZn. An apparent particle-size effect was observed for AgZn filings. The vapor pressure of Zn over filings is 15-20% higher than over the solid alloys. 11 ref.

275 Surface Tension of Solid Silver. E. R. Funk, H. Udin, and J. Wulff. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1206-1208.

Above was measured by a refinement of the Udin, Shaler, and

12. *Metals—Physical Properties and Tests*

Wulff technique. The tests were made in a purified helium atmosphere at 4 different temperatures and various times. Data are tabulated and charted.

276 Surface Tension of Solid Gold. F. H. Buttner, H. Udin, and J. Wulff. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1209-1211.

Using a modified Udin, Shaler, and Wulff technique, the surface tension of Au in purified helium was found to be 1200±65 dynes per cm. for the range 1017-1042°C.

277 Electrochemistry and the Science of Metals. Roberto Piontelli. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 99-107.

After giving an historical account of the origin and growth of electrochemistry, the author surveys the present state of knowledge on various aspects of electrochemistry that are closely related to metals. Particular attention is given to the question of the bases of electromotive force. 25 ref.

278 High-Temperature Thermal Analysis Using the Tungsten Molybdenum Thermocouple. H. T. Greenaway, S. T. M. Johnstone, and Marion K. McQuillan. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 109-114.

Describes technique which makes it possible to conduct thermal analyses at temperatures up to 2000°C. High-frequency induction heating is used, and the temperature is measured by means of a W-Mo thermocouple, for which a calibration curve is given. The method has been applied to the determination of the freezing point of pure Cr, which is shown to be 1845°± 10°C., and the liquidus curve for the solid solution of Mn in Cr.

279* A New Calculation of the Cohesive Energy of Metallic Beryllium. B. Donovan. *Nature*, v. 168, Nov. 10, 1951, p. 836-837.

Describes the above giving a comparison of results obtained with those previously calculated in the literature.

280* Magnetic Properties, Internal Strains, and the Bauschinger Effect in Metals. N. H. Polakowski. *Nature*, v. 168, Nov. 10, 1951, p. 838.

Presents findings upon which a general rule was formulated stating that work softening occurs whenever the method of cold working used tends to produce an internal stress system different from that remaining after preceding treatment, irrespective of whether the latter was of mechanical or of thermal nature.

281 Change of Resistivity of Gold by Coldworking at Liquid-Air Temperature and Its Recovery by Temporary Heating. M. J. Druyvesteyn and J. A. Manintveld. *Nature*, v. 168, Nov. 17, 1951, p. 868-869.

Short article discussing experiments on the above. Graph shows recovery of resistivity as a function of heating temperature. Resistivity decreases at +35 and −50°C. Stress-strain curve is not changed by heating.

282 Statistical Theory of Properties of Solid Solutions. R. Smoluchowski. *Physical Review*, ser. 2, v. 84, Nov. 1, 1951, p. 511-518.

Properties of binary solid solutions are considered from the point of view of the fluctuation of local composition in the crystalline lattice. These variations influence the properties of the alloys by varving the corresponding local concentration of electrons. A simple general statistical method is given for calculating properties of random and ordered solid solutions. The theory is applied to saturation magnetization, temperature coefficient of electrical resistivity, thermoelectric power, and other properties of various alloys. Satisfactory agreement with experiment is obtained. 20 ref.

283 Anomalous Resistance of Noble Metals Containing Paramagnetic Ions. A. N. Gerritsen, and J. Korringa. *Physical Review*, ser. 2, v. 84, Nov. 1, 1951, p. 604-605.

Experiments reported by Gerritsen and Linde on diluted alloys of Mn in Cu, Ag, and Au reveal anomalies which are similar but more pronounced than those observed in samples of "pure" noble metals. Presents theoretical explanation.

284 Effect of Orientation on the Metallic Reflection of Polarized Light. D. H. Woodard and E. L. Bronson. *Nature*, v. 168, Oct. 27, 1951, p. 742-743.

Presents results of a study on the above. Information concerning the nature of 3 different types of anisotropic reflection is given. Investigation was carried out on etched Monel metal, etched isotropic Al, and unetched anisotropic Be.

285 The Magnetic Susceptibility of Zinc at Liquid Nitrogen Temperatures. J. W. McClure and J. A. Marcus. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 787-788.

The magnetic susceptibility of Zn parallel to the hexagonal axis was observed to be field dependent up to 85°K. The behavior at liquid N_2 temperatures somewhat resembles the de Haas van Alphen effect with the amplitude of oscillation sharply decreased and the maxima and minima displaced in field strength.

286 Experiments With Audiofrequencies on Superconductors. B. Serin, C. A. Reynolds, J. R. Feldmeier, and M. P. Garfunkel. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 802-805.

Experiments are described in which alternating and direct currents are superimposed on Sn wires in the superconducting state. Various anomalous behaviors can be traced to the a.c. skin effect, and it is concluded that experiments of this type are not suitable for determination of the relaxation time in the phase transition from superconducting to the normal states. Data are tabulated.

287 The Change In Electrical Resistance of Magnesium on Melting. F. Hubbard Horn. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 855-856.

Describes an experiment on the above. Data are graphed.

288 The Anomalous Magnetoresistance of Bismuth at Low Temperatures. P. B. Alers and R. T. Webber. *Physical Review*, v. 84, Nov. 15, 1951, p. 863-864.

Presents results of an investigation on the above. Results are compared with those previously found.

289 The Saturation Magneto-Resistance of Iron-Aluminum Alloys. R. Parker. *Proceedings of the Physical Society*, v. 64, sec. B, Oct. 1, 1951, p. 930-931.

Measurements of resistivity and saturation magneto-resistance were made on two samples of Fe containing 2.68% and 3.60% Al respectively, in the range 78-300°C. Data are graphed.

290* The Effect of the Mean Free Path of Electrons on the Electrical Properties of Non-Metals. R. W. Wright. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 984-999.

The theories of the mean free path of electrons in various types of materials, under various conditions, are discussed. The conductivity, thermoelectric power, Hall coefficient, fractional change of conductivity in a magnetic field, and the Nernst, Ettinghausen, and Righi-Leduc coefficients are all calculated upon the Lorentz-Sommerfeld theory for the various mean-free-path theories. The variations are discussed with particular respect to the changes of reduced chemical potential. Experimental evidence is discussed and is found in general to support the theory given, both in impurity metals and semiconductors, except perhaps in the case of the thermoelectric power.

291 Electrical Conductivity of Metals at Low Temperatures; Equilibrium Between Electrons and Phonons. P. G. Klemens. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 1030-1039.

Presents a mathematical resolution of difficulties found in 2 existing theories on the above.

292 The Thermal Conductivity of Cadmium In a Magnetic Field at Low Temperatures. K. Mendelssohn and H. M. Rosenberg. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 1057-1058.

Data are graphed.

293* Theory of the Absolute Thermoelectric Potential of Thin Metal Layers and Wires. (In German.) E. Justi, M. Kohler, and G. Lautz. *Zeitschrift für Naturforschung*, v. 6a, Oct. 1951, p. 544-550.

Describes experimental and theoretical study of above and

compares results with those obtained from vapor-deposited Pb and Bi layers in order to explain the conduction mechanism of the experimental specimens; also discusses partially elastic reflection of electrons from the interior "surfaces" of the metal, and confirms the Wiedemann-Franz-Lorenz law with respect to thermal and electric conductivity.

See also:
53 (thermodynamics in metallurgy)
69 (absorption of gases in castings)
82 (reaction of Al-Mg alloys with steam)
139 (carbide-metal combinations)
265 (order-disorder transformation vs. physical properties)
297 (sintered steels—physical properties)
300 (physical properties of cast irons)
304 (physical properties of cermets)
318 (physical properties of cast iron)
499 (melting range of Sn-Pb solders)
757 (water-vapor adsorption on metals)
914 (melting-point curve of solids)
926 (ferromagnetic resonance in ferromagnetics)
1027 (thermal emission of Li-Sb cathodes)

13. METALS—MECHANICAL PROPERTIES AND TESTS

294* Pendulum Hysteresis Meter or Torsion Pendulum With Double Elastic Device for Measuring Internal Friction and Elastic Modulus of Metals in an Extensive Range From Very Low Temperatures Up to 1300°. (In French.) Christian Boulanger. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 1, 1951, p. 732-733.

Discusses briefly tests and results obtained with the above instrument.

295 Resistance to Thermal Shock. C. M. Cheng. *Journal of the American Rocket Society*, v. 21, Nov. 1951, p. 147-153.

Shows that the resistance of ceramic and ceramal materials to thermal shock can be determined by analyzing the nonsteady thermal stresses in the material. First the nonuniform temperature distribution is computed by using the heat-conduction equation. This temperature distribution is then used to compute thermal stress. Coefficients of thermal conduction and of thermal expansion, ultimate strength, Young's modulus and Poisson's ratio together with heating conditions are used to specify resistance to thermal shock. The theory is verified by comparing the results with NACA test data.

296 Strengths of Several Steels for Rocket Chambers Subjected to High Rates of Heating. R. L. Noland. *Journal of the American Rocket Society*, v. 21, Nov. 1951, p. 154-162.

Summarizes results of a series of tests conducted to determine the tensile strengths of one plain-carbon and 11 alloy steels when subjected to rates of heating comparable to those encountered by the metal parts of solid-propellant rocket motors. These results indicate that time at temperature has a very definite effect upon high-temprature strength characteristics of the steels investigated.

297* Study of Properties of Sintered Steels. (In Portuguese.) Vicente Chiaverini and Carlos de Revoredo Barros. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 346-365.

Presents results of experiments on mechanical and physical properties of the above using steel of different compositions and method of preparation. Includes tables, micrographs, and charts.

298* On Plastic Deformation Process of Compression of Metals Under High Speed. Hiroshi Yamanouchi and Yuji Matsuura. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 7-10.

Measurements were made of hammer movements in forming of Pb. Compressive displacement-time curves were mathematically analyzed and fundamental relations between the resistance of deformation, deformation speed corresponding to work done, and deformed shapes of the test pieces were analyzed. Data are graphed.

299* On the Transverse Mechanical Properties of Forgings. A. Bartocci. *Engineers' Digest*, v. 12, Nov. 1951, p. 377-378. (Translated from *Metallurgia Italiana*, v. 42, Aug.-Sept. 1950, p. 289-296.)

Influence of the dendritic structure on the transverse properties of forgings was investigated. Discusses and diagrams test results.

300* The Heat Resistance of Cast Iron and the Effect of Different Alloying Elements. (In German.) H. Timmerbeil, G. Clas, and O. Mattern. *Giesserei*, v. 38, (new ser., v. 4), Sept. 20, 1951, p. 476-482; Oct. 4, 1951, p. 523-526.

Review of literature discusses heat resistance of noraml cast iron, Si cast iron, Cr-Si cast iron, and Al-Si cast iron. Part II reports on experiments on the influence of P on the heat resistance of gray-iron castings, and also on Si, Cr-Si, and Al-Si cast iron. An alloy of 1.85% C, 6% Si, 0.6% P, 0.025% S, 4% Al and about 0.2% Ti proved to be particularly heat resistant.

301 Arc-Cast and Powdered Molybdenum Tested. J. H. Bechtold and Howard Scott. *Iron Age*, v. 168, Nov. 22, 1951, p. 92-95.

Discusses unalloyed Mo, which has good ductility but becomes brittle at temperatures not much below freezing. Tensile and creep strengths at high temperature are low. Predicts that while further research should lead to useful alloys, molybdenum-base gas-turbine blades are unlikely. Data are tabulated. 11 ref.

302 Fatigue Strength of Nodular Iron Tested. T. E. Eagon. *Iron Age*, v. 168, Dec. 13, 1951, p. 136-139.

Tests for the above were carried out on specimens cut from both standard cylinders and actual castings. Endurance ratio for the material is approximately 0.34. A 0.050-in. notch reduces fatigue strength by a factor of 1.3 for heat-treated material, 1.45 for as-cast. Elongation is usually lower in castings than in keel blocks. Data are tabulated. Diagrams.

303 Nickel Saved by Substituting 430 for 18-8. *Iron Age*, v. 168, Dec. 13, 1951, p. 144.

Discusses the chemistry of and presents mechanical properties of type 430 chromium stainless.

304 Cermets May Answer Jet Designers' Prayers. Parts I and II. W. J. Koshuba and J. A. Stavrolakis. *Iron Age*, 168, Nov. 29, 1951, p. 77-80; Dec. 6, 1951, p. 154-158.

Presents detailed information on cermet properties. While wear resistance, general high-temperature behavior and strength-to-weight ratio is good, cermets are less shock resistant, less ductile, and costly to produce. Applications in rockets, thermocouple-protection tubes, induction-heating coils and electronic cathodes are discussed.

305 Discussion of the Paper—"The Effect of Cold-Work on Steel," J. H. Andrew, H. Lee, and others. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 133-136.

Paper published in v. 165, June 1950, p. 145-184; and Aug. 1950, p. 369-395.

306 Tensile and Impact Properties of Iron and Some Iron Alloys of High Purity. W. P. Rees, B. E. Hopkins, and H. R. Tipler. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 157-168.

Tensile and impact properties of high-purity Fe and Fe-Mn, Fe-C, and Fe-C-Mn alloys, at various temperatures covering the tough to brittle transition, are discussed. The technique used to carry out tests at low temperatures is described. Attention is drawn to the two types of brittleness, intergranular and cleavage, that can occur in iron. Evidence presented indicates that oxygen is effective in promoting intergranular brittleness. The incidence of intergranular brittleness is also affected either by grain size or by some other factor resulting from the treatment used to obtain coarse grains.

307* Measurement of the Distribution of Tensile and Bond Stresses Along Reinforcing Bars. R. M. Mains. *Journal of the American Concrete Institute*, v. 23, Nov. 1951; *ACI Proceedings*, v. 48, 1951, p. 225-252.

Tensile and bond stresses were measured along reinforcing bars by a new technique which does not disturb bond stresses. Curves for representative beam and pull-out specimens show tensile-force distribution, bond-stress distribution, applied moment vs. measured bar tension, comparison of beam and pull-out tensile-force distribution, and applied load vs. slip of the bar. Comparison of ordinarily calculated bond with measured

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local maximum values shows the calculated values to be frequently less than one-half the values measured in these tests. The effect of standard hooks on the behavior of plain and deformed bars is shown. Evidence is presented that cracks in beams decisively affect magnitude and distribution of tensile and bond stresses. Diagrams, tables, and extensive graphical data.

308 The Crystallographic Aspect of Slip in Body-Centered Cubic Single Crystals. I. Theoretical Considerations. A. J. Opinsky and R. Smoluchowski. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1380-1384.

The mechanism of slip in body-centered cubic lattices is considered in terms of the relation between the orientation of the tensile axis and the active slip system. Graphs and diagrams.

309 Distribution of Slip in Metal Crystals. F. C. Frank. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1387.

Discusses previous literature findings on deformation in Zn crystals.

310 Mechanical Properties of Arc-Cast and Powder Metallurgy Molybdenum. James H. Bechtold and Howard Scott. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 495-504.

Surveys the above. Micrographs, tables, and graphs are presented. 14 ref.

311 Recent Progress in the Plastic Methods of Structural Analysis. P. S. Symonds and B. G. Neal. *Journal of the Franklin Institute*, v. 252, Nov. 1951, p. 383-407.

Reviews recent developments in methods of plastic failure analysis based on certain simple hypotheses as to the carrying capacity of flexural members. The basic hypotheses are first defined and a simple example is given to illustrate their use. Certain physical assumptions are made concerning the carrying capacity of flexural members of mild steel. 19 ref.

312 Slip Bands and Hardening Processes in Aluminum. A. F. Brown. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 115-124.

Slip bands in Al increase in number during plastic deformation and, at the same time, further slip occurs within each band. At higher temperatures and lower rates of deformation, as well as with increasing strain under all conditions, the latter process becomes increasingly predominant. This is interpreted on the basis of the fine structure of slip bands resolved by the electron microscope. Differences in density and inner structure of slip bands formed under different conditions are compared with differences between stress-strain curves.

313 The Creep and Softening Properties of Copper for Alternator Rotor Windings. N. D. Benson, J. McKeown, and D. N. Mends. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 131-142.

Resistance to creep of a number of high-conductivity coppers was investigated in the range 130-225°C. Softening characteristics were also determined over the same temperature range. Creep-resistance and resistance to softening was shown to be very much greater for Ag-bearing (0.1% Ag) than for Ag-free, tough-pitch Cu. Creep-resistance and resistance to softening of OFHC Cu are greater than those of tough-pitch coppers, when both are Ag-free. Ag-bearing (0.1%) OFHC and tough-pitch coppers have similar resistances to creep and softening. 12 ref.

314 An Investigation of the Structural Changes Accompanying Creep in a Tin-Antimony Alloy. W. Betteridge and A. W. Franklin. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 147-150.

A Sn+5% Sb alloy was used for a microscopical study of phenomena occurring during creep at room temperature. In addition to general slip within the grains and flow at the grain boundaries, it is shown that localized strain within the grains occurs in directions associated with boundaries between adjacent grains. It is also suggested from this work, and from an examination of a pure Al sample strained in creep at 250°C., that the "cell structure" observed by X-ray examination is a result of the break-up of the grains by slip bands and by local strains. 10 ref.

315 Effect of Hydrogen on the Properties of Low-Alloy Steels. J. D. Hobson and C. Sykes. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 209-220.

A method is described by which hydrogen is introduced into steel specimens by heating them in the gas at high pressures. Its deleterious effect on the ductility of a number of low-alloy steels was investigated and shown to be reproducible, provided that their heat-treatment is also considered. Illustrations, graphs, and micrographs. 12 ref.

316 Macroscopic Surface Stresses Produced by Plastic Deformation. G. B. Greenough. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 235-241.

Presents results of an investigation on the above using a low-carbon steel containing 0.10%C, 0.36% Mn, 0.017% Si, and 0.007% P. Results show that there is a macroscopic compressive biaxial stress in the surface of an aggregate; the layer containing the stress being about two crystals (8×10^{-3} in.) deep. 12 ref.

317 Change in Yield Strength During Aging in Iron. C. A. Wert. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1179-1180.

Results of experiments on high-purity Fe (Puron) are charted and discussed. Aging was done at 40, 65, and 130°C., respectively, after carburizing to about 0.015%C.

318 Physical and Mechanical Properties of Cast Iron. W. Leighton Collins. *Mechanical Engineering*, v. 73, Dec. 1951, p. 979-982. (Based on "Engineering Properties of Cast Iron," *American Foundrymen's Society*.

Presents the above from the viewpoint of an engineer designing a load-resisting member. A design procedure is outlined. Data are tabulated.

319* The Influence of Precipitation Processes Upon the Determination of Creep Resistance of Light-Metal Alloys. (In German.) H. Vosskühler. *Metall*, v. 5, Nov. 1951, p. 475-479.

In order to avoid structural changes during creep testing of light alloys, preliminary heating of the test rods is suggested. Method for the tests is indicated; results are tabulated, charted, and interpreted. They seem most significant for Al-Mg alloys containing 8.50% Mg. 15 ref.

320 High-Temperature Embrittlement in Chromium-Iron Alloys Containing 12-16% Chromium. Helmut Thielsch. *Metallurgia*, v. 44, Nov. 1951, p. 220-226.

The embrittlement which may be shown by ferritic stainless steels on heating at elevated temperatures is discussed. It is shown that grain growth is not responsible and the suggestion is made that the embrittlement may be related to effects caused by solution of carbide at elevated temperatures. Means whereby the carbide solution may be prevented, or its effects overcome, are indicated. Micrographs.

321* Alternate Torsion Testing of Wires. (In Italian.) R. Zoja. *Metallurgia Italiana*, v. 43, Oct. 1951, p. 421-424.

During above type of test, 3 distinct periods are evident: uniform deformation, localized deformation in a short length, and rupture. Presents and discusses results of application of this test to steels and several nonferrous alloys.

322* Some Data on the Influence of Forging Reduction on the Toughness of High-Speed Steel. (In Italian.) Giorgio Magliano. *Metallurgia Italiana*, v. 43, Oct. 1951, p. 439-442.

Reports results of tests on round bars already reduced 50-96% in an attempt to reduce the minimum forging reduction necessary to obtain satisfactory core properties. Such reduction does not appear to be feasible.

323 A Metallurgist Looks at Fracture. C. H. Lorig. *Metal Progress*, v. 60, Nov. 1951, p. 69-76.

Discusses the fracture aspect of metals. Demonstrates that microstructural features are responsible for several kinds of processes that can lead to fracture. Conditions of boundaries between grains and the nature of microconstituents at grain surfaces were studied. Microphotographs.

324 Structural Changes During the Creep of Aluminum. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 520-

524, 528. (Based on a paper presented by Crussard and Wyon to the Société Francaise de Métallurgie in Paris.)

Describes results of an investigation on the above which occurs particularly at high temperatures. Micrographs. 14 ref.

325 Development of Research in High-Temperature Rheology of Metals. (Continued.) Paul Feltham. *Metal Treatment and Drop Forging*, v. 18, Oct. 1951, p. 455-459.

Discusses new methods which are slowly coming into prominence. These methods rely upon a detailed examination of the structural changes induced by heat and stress, rather than on simple mechanical tests. Apparatus is diagrammed and illustrated; photomicrographs show typical results. 22 ref.

326* Canadian Progress in Magnesium Extrusion Alloys. H. G. Warrington. *Modern Metals*, v. 7, Nov. 1951, p. 23-27.

By using high-purity metal made by the ferrosilicon process, the Canadians claim to have achieved a better combination of properties in wrought Mg Alloys. During the past few years, Dominion Magnesium Limited has been conducting a program designed to simplify the range of wrought Mg alloys while achieving higher mechanical properties and good workability. The new Zn-Zr alloy, ZK61, has figured prominently in this program. The author believes that the growing strength-to-weight ratio of wrought Mg alloys constitutes a definite challenge to Al alloys and steel.

327 Creep of Annealed and Cold-Drawn High-Purity Copper. William D. Jenkins and Thomas G. Digges. *Journal of Research of the National Bureau of Standards*, v. 47, Oct. 1951, p. 272-287.

A study was made of the effect of temperature and stress on the creep behavior at 110, 250, and 300°F. of high-purity, oxygen-free, high-conductivity copper initially as annealed and as cold-drawn to 40% reduction of area. Correlations are made of changes in structure with time, stress, temperature, and discontinuous flow. Micrographs.

328 Formula for Creep Curves of Metals. Ryukiti Robert Hasiguti and Tosiro Owadano. *Nature*, v. 168, Oct. 20, 1951, p. 706.

Presents the above based on experiments on Al. Data are tabulated.

329* A Study of Tracer Methods for Assessing Wear of Wire-Drawing Dies. J. C. E. Button, A. J. Davis, and R. Tourret. *Nucleonics*, v. 9, Nov. 1951, p. 34-43.

Irradiation of tungsten carbide dies was used to provide a means of measuring die wear. The activity of die debris adhering to drawn wires was then quantitatively measured by Geiger counters. Data are tabulated and graphed.

330* A Theoretical Derivation of the Plastic Properties of a Polycrystalline Face-Centered Metal. J. F. W. Bishop, and R. Hill. *Philosophical Magazine*, ser. 7, v. 42, Nov. 1951, p. 1298-1307.

In continuation of a previous paper, it is conjectured that the work done in plastically deforming a polycrystal is approximately equal to that which would be done if the grains were free to deform equally. In conjunction with the principle of maximum plastic work, this enables the yield function of an aggregate to be calculated. This is done for an isotropic aggregate of face-centered cubic crystals, following a determination of the stresses needed to produce multi-slip.

331 A Realistic Approach to the Use of Titanium. Herman H. Hanink. *Product Engineering*, v. 22, Nov. 1951, p. 164-171.

Describes experimental work undertaken to determine mechanical properties of certain hot-rolled and annealed alloys; effect of heat-treatment on these properties; the difference in properties between forged parts and test-bar specimens; and behavior of machined Ti components subject to dynamic loading under simulated engine operating conditions.

332 Mechanical Properties of Integrally Stiffened Aluminum Extrusions. Roberto Contini. *Product Engineering*, v. 22, Dec. 1951, p. 129-133.

Describes materials properties, including values for skin and flanges, of integrally stiffened 24S and 75S Al-alloy extrusions. Test results on behavior of tubular and flattened sections under column and bending loads are given. General comparison of data with design values is presented. Data are tabulated.

333 Heat Treated Brittle Coating Increases Sensitivity. A. J. Durelli and S. Okubo. *Product Engineering*, v. 22, Dec. 1951, p. 144-147.

Presents results of an investigation on the above. An example of a complete stress analysis using heat treated brittle coating on a valve under internal pressure is given.

334* Special Mechanical Properties of Aluminum Alloys Having a High Yield Point and High Tensile Strength. (In French.) Marcel Tournaire. *Revue de l'Aluminium*, v. 28, Oct. 1951, p. 353-361.

Shows effects of fabrication process on mechanical properties, giving the best yield and tensile strengths attainable with various common Al alloys. Data are charted and tabulated.

335* The Fatigue of Metals; Grooved Parts. (In French.) M. Ros. *Revue de Métallurgie*, v. 48, Oct. 1951, p. 723-733.

Correlates results of tests made by LFEM during past 20 years, demonstrating that the Coulomb-Mohr theory can be considered as a general theory of the rupture of metals. Includes diagrams.

336* Influence of Polygonization on Certain Properties of Aluminum. (In French.) D. McLean and A. E. L. Tate. *Revue de Métallurgie*, v. 48, Oct. 1951, p. 765-776; disc., p. 776-777.

Describes influence of polygonization on tensile strength at room temperature and on creep resistance. Includes photomicrographs, tables, and diagrams. 14 ref.

337* Behavior and Basic Principles of Metallic Structures. (In French.) J. F. Baker. *Revue de la Soudure; Lastijdschrift*, v. 7, no. 3, 1951, p. 128-146.

Reviews and diagrams above on the basis of the literature, with special regard to the ductility of steel. 37 ref.

338 Report on Nodular Cast Iron. *SAE Journal*, v. 59, Dec. 1951, p. 23-24, 26.

Surveys the above in order to correlate test-bar properties. Comparison is made with malleable iron, steel castings, and gray iron.

338a Five Ways to Use Bonded-Wire Strain Gages. *SAE Journal*, v. 59, Nov. 1951, p. 28-29. (Excerpts from "Methods for Evaluating Loads and Stresses for Machine Design," by F. G. Tatnall.)

Discusses the above giving diagrams.

339* Many Ramifications of Wear Problem Discussed. V. A. Crosby. *SAE Journal*, v. 59, Nov. 1951, p. 30-31.

Presents a survey on wear problems. Wear resistance of parts as related to the structure, hardness, and heat-treatment of gray iron was stressed.

340* Tests for SAE Grade 5 Bolts. A. S. Jameson. *SAE Journal*, v. 59, Nov. 1951, p. 54-59.

Presents an investigation made to determine possible advantages in the use of torsion testing over tensile testing for the evaluation of bolts. Properties measured (proprotional limit, torsional shear and degrees twist), correspond roughly to the three tensile properties: yield strength, tensile strength, and total elongation. Data are graphed.

341* Aluminum-Zinc-Magnesium Base Alloys. (In German.) *Schweizer Archiv für angewandte Wissenschaft ünd Technik*, v. 17, Oct. 1951, p. 289-298.

Graphs and photomicrographs supplement discussion of compositions, mechanical properties, transformations, and microstructures of various alloys of above type. Only those which contain mostly Al are considered.

342* Testing Heat-Resistant Materials. (In German.) W. Deisinger. *Schweizer Archiv für angewandte Wissenschaft ünd Technik*, v. 17, Oct. 1951, p. 299-305.

Discusses the difficulties and absence of uniform standards of high-temperature property testing and describes various methods of determining mechanical properties of metals and alloys at elevated temperatures. Photographs, graphs, and photomicrographs are presented. 10 ref.

343* Relation Between Internal Friction and Resistance to Creep of Steel As a Function of Microstructure. (In

13. *Metals—Mechanical Properties and Tests*

French.) Christian Boulanger, Georges Delabart, and Michel Ravery. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 8, 1951, p. 794-796.

Presents results of above study in which 4 different steel microstructure types were investigated.

344* The Development of Cemented-Carbide Alloys in Germany. (In German.) Ernst Ammann and Joseph Hinnuber. *Stahl und Eisen*, v. 71, Oct. 11, 1951, p. 1081-1090.

Describes development of WC-Co alloys, influence of structure and properties, and practical applications. Those containing TiC are superseding previous compositions. Effects of addition of TaC are also described. Mechanical properties are tabulated and charted. Micrographs and macrographs illustrate structures. 51 ref.

345* Buckling of Intermittently Supported Rectangular Plates. C. H. Norris, D. A. Polychrone, and L. J. Capozzoli. *Welding Journal*, v. 30, Nov. 1951, p. 546s-556s.

Presents studies of the buckling behavior of long rectangular plates intermittently supported on one or both long edges with various supports and loadings. Material studied was structural steel. Data are tabulated and graphed. Illustrations.

346* Properties of Metals Used at Low Temperatures. *Welding Journal*, v. 30, Nov. 1951, p. 572s-575s.

A summary of 9 papers previously published in the July 1951 issue of *Metal Progress*. Papers were presented at the Annual Metallurgical Conference and Open House held at the National Bureau of Standards on May 14 and 15, 1951.

347* Further Tests on Effects of Plastic Strain and Heat Treatment. Sadun S. Tor, Robert D. Stout, and B. G. Johnston. *Welding Journal*, v. 30, Nov. 1951, p. 576s-584s.

Covers transition-temperature test results of two plain-carbon pressure-vessel steels in the following conditions: as-received, after 20% permanent tensile strain, after cylindrical bending and after hot- or cold-spherical pressing. Data are graphed and tabulated. Diagrams.

348 Inspection; NAI Students Design Unique Stress Testing Rings. James Corcoran. *Western Machinery and Steel World*, v. 42, Nov. 1951, p. 103-104.

Describes and illustrates new dynamometer test method and apparatus.

349 High Strength Copper-Silver, Copper-Iron, and Copper-Iron-Chromium Wire. Webster Hodge, Ralph A. Happe, and Bruce W. Gonser. *Wire and Wire Products*, v. 26, Nov. 1951, p. 1033-1038, 1086.

Discusses some new Cu-base alloys that have been made into wire to produce some unusual properties. The use of an insoluble metal like Fe, uniformly distributed as reinforcing fibers through the Cu matrix is an interesting new concept in wire making. Data are graphed, micrographs.

Miscellaneous Publications

350 A Survey of Creep in Metals. A. D. Schwope, and L. R. Jackson. National Advisory Committee for Aeronautics, Technical Note 2516, Nov. 1951, 66 pages. (TL570 Un3t)

Summarizes numerous theories relating to creep phenomena and the extent of current knowledge on the subject. Various possible mechanisms by which creep occurs both in single crystals and in polycrystals are described. 199 ref.

352 A Combined Stress Test Machine for Evaluating Heat-Resistant Alloys. William Foster. Proceedings of the Society for Experimental Stress Analysis, v. 9, no. 1, 1951, p. 211-220. (TG265 So13p)

353 Development and Use of High-Temperature Strain Gages. R. E. Gorton. *Proceedings of the Society for Experimental Stress Analyses*. v. 9, no. 1, 1951, p. 163-176. (TG265 So13p)

Discusses the above giving applications to engines. Various performance factors are considered. Illustrations.

354 Testing Hot Metal Ladles. K. E. Knudsen, W. H. Munse, and B. G. Johnson. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 11-18. (TG265 So13p)

Problems involved in the above are discussed. Strains were measured with SR-4 electric strain gages, and deflections, by means of deflection dials reading to 1/1000 in. Diagrams.

See also:

76 (additions vs. mechanical properties of cast steels)
95 (25%-Cr ferrites—properties)
114 (steels and cast irons—microstructure vs. tool life)
120 (tensile strength of Al-Sn alloys)
121 (wear of cemented carbides)
124 (hardness anisotrophy in SiC)
128 (carbides—mechanical properties)
129 (shot-peening effects on steel gears)
139 (carbide-metal combinations)
140 (mechanical properties of stainless-steel powder)
141 (sintered Al—mechanical properties)
143 (properties of sintered-iron parts)
150 (tensile strength and hardness of welds in Al-Mg alloys)
159 (submerged-arc welds in steel)
172 (stamps, dies, and punches—mechanical properties)
177 (mechanical properties of cast iron)
178 (thermal treatment vs. hardness—duralumin)
179 (annealing vs. toughness—low-alloy steels)
180 (Stellites—heat-treatment effects)
187 (abrasion resistance of anodic films on Al)
202 (ductile-brittle transformation in Zn single crystals)
237 (properties of U_3C_3)
248 (alloys of Ti with O, C, and N)
265 (order-disorder transformation vs. mechanical properties)
271 (tensile strength of stainless-steel wire)
280 (stresses resulting from cold working)
281 (stress-strain curve of gold)
379 (Cr-Mo steels—creep strength)
496 (low-temperature tensile-test equipment)
517 (steel plates in coal cars)
519 (wear resistance of new carbides)
521 (mechanical properties of Al cable sheathing)
523 (wear resistance of Al-steel trolley wires)
623 (static and kinetic coefficients of friction)

14. CORROSION

355* The Mechanism of Intergranular and Stress Corrosion of Aluminum-Magnesium and Aluminum-Zinc-Magnesium Alloys. (In French.) Pierre A. Jacquet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 15, 1951, p. 871-873.

Presents new facts and their consequences with respect to above as result of recent research of the author.

356* Technical Practices in Cathodic Protection. *Journal American Water Works Association*, v. 43, Nov. 1951, p. 883-896.

Describes briefly the fundamentals of the application of cathodic protection, and the mitigation of any electrolytic corrosion that may be caused by stray current from cathodic-protection systems. 62 ref.

357* On Acid Resisting Silicon-Steel. Ichiro Iitaka and Kazuhiko Sekiguchi. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 5-6.

Presents results of a study on corrosion resistance of 5.5% Si steel to HCl adding various quantities of Cu to improve the resistance.

358 Alcohol vs. Construction Materials. *Chemical Engineering*, v. 58, Nov. 1951, p. 288, 290, 292-294, 296-298, 300-302, 304-305.

Introductory portion by William C. Moore is followed by the following brief articles which discuss corrosion resistance of different articles to ethyl alcohol: "Worthite," W. E. Pratt; "Hastelloy," E. D. Weisert; "Glass Lining," S. W. McCann; "Coatings," Kenneth Tator; "High-Silicon Irons," Walter A. Luce; "Durimet 20," Walter A. Luce; "Rubber," O. S. True; "Chlorimets," Walter A. Luce; "Cements," Raymond B. Seymour; "Iron and Steel," A. W. Spitz; "Nickel and Nickel Alloys," W. Z. Friend; "Stainless Steel," W. G. Renshaw; "Aluminum," J. P. Balash and E. D. Verink, Jr.; "Silicones," J. A. McHard and Leon Van Volkinburg; and "Lead," Kempton H. Roll.

359 Potential Measurements for Determining Cathodic Protection Requirements. Scott P. Ewing. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 410-417; disc., 417-418.

Study of the above shows that pipe lines or other buried or submerged structures can be protected against corrosion by maintaining them at some definite potential with cathodically applied current. The exact potential at which corrosion is stopped will vary with the environment. Data are graphed and tabulated.

360 Sodium Hydroxide as Inhibitor of Pitting in 18-8 Stainless Steel. J. W. Matthews and H. H. Uhlig. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 419-421; disc., p. 421-422.

The pitting mechanism results from galvanic action between a major surface of passive metal acting as cathode and a small active area of metal acting as anode. Potential measurements show that NaOH depresses the noble potential of passive 18-8 stainless steel, hence diminishing the operating potential of the passive-active cell. In addition, the fast moving hydroxyl ion reacts with any passivity-destroying corrosion products such as $FeCl_2$ at the anode, thereby blocking the chain reactions that initiate pitting.

361 Corrosion Aspects of Fusion Welded Aircraft High-Strength Aluminum Alloys. Loren W. Smith. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 423-437; disc., p. 437.

Discusses metallurgical structures resulting from the fusion welding of Al alloys and correlates these structures with corresponding corrosion data. The results of several investigations on the corrosion resistance of fusion-welded 24S, 61S, and 75S Al alloys are reported. Tensile-strength comparisons of bare and clad welded alloys exposed to corrosive mediums in the as-welded, aged, and reheat treated conditions are made. Micrographs. 19 ref.

362 The Mechanism of Knife-Line Attack in Welded Type 347 Stainless Steel. M. L. Holzworth, F. H. Beck, and M. G. Fontana. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 441-449.

The above mechanism is based on the solid solubility of Cb in 18-8 stainless steels at high temperatures with subsequent formation of grain-boundary chromium carbide during the sensitizing treatment. This type of corrosion was observed in fuming HNO_3 and also in boiling 65% HNO_3. Experiments were conducted on regular Type 347 and extra-low-carbon Type 347 stainless steels. The latter appeared to be less susceptible to knife-line attack. Micrographs. 12 ref.

363* Corrosion of Materials. *Gas Times*, v. 69, Oct. 19, 1951, p. 117-118.

Outlines results reported by the Director of the Gas Research Board in his 1950 report. Includes photomicrographs showing structures of Pb-Sn and Pb-Ni coatings before and after corrosion for 350 hrs. at 150°C.

364* Construction Materials That Stop Sulfuric Acid Corrosion. 1 and 2. S. W. Shepard. *Industry and Power*, v. 61, Nov. 1951, p. 99-100; Dec. 1951, p. 85-86, 132.

Discusses types and applications of materials that help in solution of problems involving corrosion, abrasion, heat, and pressure. Limitations in the use of cast iron and steel and ways of compensating for them are given.

365 The Curing of Lead Storage Battery Plates. R. H. Greenburg, F. B. Finan, and B. Agruss. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 474-478.

Describes a series of experiments made to determine the effects of variations in ambient temperature on the course of the oxidation reaction. The oxide used consisted of approximately 30% metallic lead, the remainder being litharge. Data are graphed.

366 The Causes of the Localized Character of Corrosion on Aluminum. C. Edeleanu and U. R. Evans. *Transactions of the Farady Society*, v. 47, Oct. 1951, p. 1121-1135.

Pitting and localized attack on aluminum is explained by the autocatalytic character of the anodic corrosion reaction; theoretical considerations suggest that if anodic current density becomes high at one point, it will tend to become higher, until checked by the evolution of hydrogen, which tends to produce a film of oxides or hydroxide over the point and slow down the reaction. Data are graphed. 29 ref.

367 The Kinetics of the Dissolution of Zinc in Aqueous Iodine Solutions. Part I. L. L. Bircumshaw and A. C. Riddiford. *Journal of the Chemical Society*, Feb. 1951, p. 598-603.

A preliminary study of the rate of the above was made. The observed rate is of first order with respect to iodine concentration and is directly proportional to apparent surface area of the Zn specimen over the range investigated. With the exception of specimens polished with rouge, method of preparation of the surface is without effect on rate.

368 The Kinetics of the Dissolution of Zinc in Aqueous Iodine Solutions. Part II. L. L. Bircumshaw and A. C. Riddiford. *Journal of the Chemical Society*, June 1951, p. 1490-1493.

An increase in the concentration of KI produces a marked increase in the rate of dissolution of Zn in aqueous iodine solutions. This increase is comparable with the increase in the coefficient of diffusion of iodine under the same conditions, and both are correlated with the decrease in kinematic viscosity of the solution.

369* The Pitting of Zinc by Distilled Water and Dilute Solutions. U. R. Evans and D. E. Davies. *Journal of the Chemical Society*, Oct. 1951, p. 2607-2614.

The vertical arrangement of pits produced on zinc by distilled water, the corrosion products, and their formation were studied. The vertical alignment is due to corrosion product from an upper pit lodging at points below, and screening them from oxygen; lines of pits can also be set up by the screening action of a polythene thread. A Zn disc whirled in distilled water containing oxygen suffers no pitting. In stagnant water containing oxygen under high pressure, Zn remains unchanged; at ordinary pressure, it becomes pitted. Results are explained on the basis of the theory of oxidation and corrosion advanced by Hoar and Evans.

370 Metallurgical Mechanism for Mercury Stress Cracking of Copper Alloys. W. D. Robertson. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1190-1191.

Discusses possible mechanisms of the above and gives experimental results for Cu and for brass (69% Cu). Conclusions are summarized.

371* Research on Stainless Steels. Part II. Some Measurements of Their Resistance to Intercrystalline Corrosion. (In Italian.) Antonio Ferri. *Metallurgia Italiana*, v. 43, Oct. 1951, p. 432-434.

Tests were made on 3 types of austenitic 18-8 steels in order to evaluate the sensitivity of Strauss' test and of tests in boiling HNO_3. The former was found to be more sensitive. The spread in corrosion results is shown to be related to a number of factors such as grain size, amount of carbide precipitation, and surface condition of samples. 23 ref.

372 Dry Oxidation and Wet Corrosion. U. R. Evans, *Nature*, v. 168, Nov. 17, 1951, p. 853-855.

Presents an interpretation of the above phenomena. Attempts to show that they are not wholly disconnected on the basis that alloying constituents added to combat the former often prevent the latter. Discusses high-temperature oxidation, oxygen in wet corrosion, electrochemical mechanism, inhibitors, effects of sulfur and impurities. 19 ref.

373 Iron/Sulphide Ratios in Corrosion by Sulphate-Reducing Bacteria. C. J. P. Spruit, and J. N. Wanklyn. *Nature*, v. 168, Dec. 1, 1951, p. 951-952.

Describes an investigation of the above on ingot iron. Results showed that it is because of their sulfide-producing action that the bacteria stimulate corrosion.

374 Device Aids Corrosion Study. D. H. Stormont. *Oil and Gas Journal*, v. 50, Dec. 6, 1951, p. 92.

Describes a device which permits corrosion coupons to be readily introduced or removed from pipe lines, heater tubes, and well-head equipment while they are in service. Corrosion resistance of various steels and metals under actual operating conditions can be studied.

375* Corrosion of Fourdrinier Wire Cloth. A. G. Hose. *Paper Mill News*, v. 74, Nov. 24, 1951, p. 16, 18.

Discusses various types of corrosion found in the above, which is composed of bronze warp and brass shute.

14. *Corrosion*

376 Selecting Alloys to Resist Corrosion. B. B. Morton. *Petroleum Processing*, v. 6, Nov. 1951, p. 1233-1235.

Types of alloys are described which are resistant to high-temperature corrosion from sulfur and organic acids and solvents. Protection of equipment in some of the newer refining methods, including solvent lubricating-oil manufacture, is discussed.

377 The Structure of Thin Layers of Zinc Oxide Grown on a Zinc Single Crystal. L. N. D. Lucas. *Proceedings of the Physical Society*, v. 64, Oct. 1, 1951, p. 943-945.

Presents results of a study on the above. The fact that an electron-diffraction pattern can be obtained from the Zn mother crystal through the overlying layer of ZnO makes it possible to set up an upper limit to the thickness of this layer.

378* Research on the Anodic Oxidation of Ferrochromium. II. Oxidation in Potassium Solution. III. Oxidation in Solutions of Carbonate, Bicarbonate, and Alkaline Chromate. (In French.) Jean Besson and Chu Yung Chao. *Bulletin de la Société Chimique de France*, Sept.-Oct. 1951, p. 763-772.

Two ferrochromium compositions were studied. Data are extensively charted and discussed.

379* Belgian Research on Chromium-Molybdenum Steels. (In French.) P. Coheur. *Revue Universelle des Mines, de la Métallurgie des Travaux publics, des Sciences et des Arts appliques a l'Industrie*, ser. 9, v. 94, Oct. 1951, p. 336-348.

Surveys the fabrication of above steels for creep and corrosion resistance. Transformations curves, and effects of heat treatments, of temperature, of time, and of stress were studied. Photomicrographs, diagrams, tables, and graphs.

380* Dissolution Rate of Iron in O.1N Hydrochloric Acid During the First Few Seconds. (In German.) Heribert Grubitsch and Hikka Väyrynen. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 362-365.

For polished test specimens, the increased dissolution rate in the first few seconds is due to presence of an oxide coating. Tests on specimens free of oxide show an increase in the initial solution rate in both aqueous and ethereal HCl. This is explained by increased reactivity of the active Fe atoms at the surface. Solubility curve of polished samples is compared with that of coarsely filed samples. Data are charted and tabulated. 10 ref.

381* Phase Boundary Lines, Especially Their Significance in Corrosion. (In German.) Rudolph Auerbach. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 365-367.

Discusses the above subject for the cases of 2 phases having a common plane, and 3 phases having only a common boundary line. Adsorption in the 1st case and "adlination" in the 2nd both diminish the free energy and activity of the boundary, thus inhibiting corrosion. Discusses application to local cells, glow cathodes, and catalysts consisting of several components.

382* Measurement of the Oxide Film on Platinum. II. (In German.) Heribert Grubitsch and Fritz Tödt. *Werkstoffe und Korrosion*, v. 2, Nov. 1951, p. 415-416.

On the basis of previous work, a theory of the mechanism of oxide formation on Pt is developed. The various results of Tödt and of Grubitsch, especially the time dependence of oxygen charging of a Pt surface in an oxygen-containing electrolyte, can be explained on the basis of the above theory.

Miscellaneous Publications

383 Rotogenerative Detection of Corrosion Currents. Joseph B. McAndrew, William H. Colner, and Howard T. Francis. National Advisory Committee for Aeronautics, Technical Note 2523, Nov. 1951, 12 pages. (TL570 Un3t)

A new technique for studying corrosion phenomena is described. The method permits the detection of the presence of currents produced by local cells on the surface of a corroding metal specimen. Illustrations and diagrams.

Books

384 Corrosion Guide. Erich Rabald. 629 pages. 1951. Elsevier Publishing Co., Inc., New York. (TA407 R11C)

The old tried methods are catalogued with their advantages and deficiencies. In addition, the tabular arrangement of performance of materials in use gives the user an opportunity of finding out easily about other materials. General considerations are given on the selection of materials. This is followed by a short introduction to the general aspects of corrosion, a knowledge of which leads to better use of the data given later. The bibliography at the end of the book indicates the most important books and journals for those particularly interested.

See also:

95 (25%-Cr ferrites—intercrystalline corrosion)
188 ("fishscale" on porcelain-enameled steel)
197 (lead cladding of Cu and steel to prevent corrosion)
221 (corrodibility of Be-Cu alloys)
224 (anodic oxidation of Al)
521 (corrosion resistance of Al cable sheathing)

15. ANALYSIS—CHEMICAL AND PHYSICAL

385* Carbon Effect in the Spectrographic Analysis of Refractory Materials. (In French.) Raymond Ricard. *Comptes Rendus hebomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 953-954.

Summarizes results of a study of the above.

386* Determination of Traces of Sodium, Copper, and Rare Earths in High-Purity Aluminum by the Pile-Activation Method. (In French.) Philippe Albert, Michel Caron, and Georges Chaudron. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1108-1110.

Describes development of procedure for the above in which the specimens are exposed in an atomic pile. The formation of radioactive isotopes of trace impurities makes possible determination of the amounts present.

387* Spectrochemical Analysis of Steelmaking Slags; Preparation of Synthetic Standards by Sintering. (In French.) René Castro and René Loude. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 29, 1951, p. 1031-1033.

Outlines rapid and accurate techniques for analysis of various types of the above containing 30-70% CaO; up to 50% Al_2O_3, 20-30% SiO_2, FeO, Cr_2O_3, or MgO; and a few percent of TiO_2 or MnO_2.

388 Determination of Tin, Silver, Iron, Bismuth and Copper in Lead. W. L. Miller, Mario Acampora, and George Norwitz. *American Foundryman*, v. 20, Nov. 1951, p. 43,93.

Describes rapid and convenient sequence method for the above. Cu is determined colorimetrically with rubeanic acid in a procedure novel in its application to Pb analysis. The other elements are determined by familiar procedures suitably modified.

389* Inorganic Chromatography on Cellulose. Part VI. The Extraction and Determination of Gold. N. F. Kember and R. A. Wells. *Analyst*, v. 76, Oct. 1951, p. 579-587.

Two chromatographic methods are described for the quantitative separation of gold from many other metals. Special attention is given to the separation of Au from the 6 Pt metals.

390* The Determination of Fluorine in Organic Compounds. R. Belcher and J. C. Tatlow. *Analyst*, v. 76, Oct. 1951, p. 593-595.

In the method described, decomposition is effected with sodium in a nickel bomb of special design and fluoride ion is determined gravimetrically as lead chlorofluoride.

391* Estimation of Phosphorus by Ceric Sulphate. G. S. Deshmukh. *Analyst*, v. 76, Oct. 1951, p. 604-605.

Ceric sulfate oxidixes phosphorus quantitatively to phosphoric acid. Describes a new titrimetric method for estimation of red phosphorus based on this oxidation. Adaptation of this procedure to determination of solubility of phosphorus in various solvents is suggested.

392* Potentiometric Titration of Small Amounts of Bromides. Peter Wade. *Analyst*, 76, Oct. 1951, p. 606-609.

The construction and use of an electrode assembly for titration of quantities of bromide of the order of 0.1 mg. and less in a minimum volume of 1 ml. are described.

393* New Method for Direct Determination of Oxygen Applied Particularly to Coal. (In French.) Raoul Wildenstein. *Chaleur & Industrie*, v. 32, Oct. 1951, p. 293-298.

Presents a comparative study of a new method for the above, in which the organic matter is heated in a H_2 stream, and of older methods in which the material is heated in a N_2 stream or at 1000°C. in a H_2 atmosphere.

394 Determination of Organic Halogen; A Survey of Methods Available. *Chemical Age*, v. 65, Oct. 27, 1951, p. 549-554.

28 references.

395 Analytical Chemistry of the Less Common Alkali Metals. Part III. Rubidium & Caesium. (Concluded.) T. S. West. *Chemical Age*, v. 65, Nov. 3, 1951, p. 595-598, 602.

59 additional references.

396 The Analytical Chemistry of Silicon. *Chemical Age*, v. 65, Nov. 10, 1951, p. 633-637. (Based on paper by H. Thomas.)

Reviews literature on the above.

397 Rapid Estimation of TiO_2; a Faster Analysis of Ilmenite. *Chemical Age*, v. 65, Nov. 24, 1951, p. 687.

Describes the above. Method is not suitable for ilmenite ores containing columbite.

398 Photometric Determination of Iron Traces in Zinc and Aluminum. *Chemical Age*, v. 65, Dec. 1, 1951, p. 735-738.

Presents results of an investigation on the above. Following points were checked: effect of acid concentration and of sulfosalicylic acid content; sensitivity of the quantitative detection of Fe in solutions free from foreign salt; and effects of Zn, Al, Zn and Al contaminants.

399 The Alkalimetric Determination of Metals With the Aid of Acid-Base Indicators. J. F. Coetzee. *Journal of the Chemical Society*, April 1951, p. 997-1004.

Deals with the determination of Al, Cd, and Co, by titration with standard alkali. Completion of precipitation of the metallic hydroxide is determined with the aid of a suitable acid-base indicator. Similarly, free mineral acid may be titrated in the presence of these metals by use of an indicator of proper pH range. This principle has now been applied for the first time to the determination of Co. Mayer's procedure for the determination of Al has been substantially modified, and a new one proposed for Cd.

400* The Detection of Metallic Elements. Christina C. Miller. *Chemistry & Industry*, Oct. 6, 1951, p. 831-834.

Discusses the above using chemical methods. 31 ref.

401* Chromatography. (In German.) **Theoretical Principles of Chromatography.** R. Signer. **Column Chromatography and Its Application to Fat-Soluble Vitamins.** O. Isler. **Paper Chromatography.** P. v. Tavel. *Chimia*, v. 5, Nov. 15, 1951, p. 245-260.

Above articles include tables, graphs, diagrams, and numerous references.

402* Hydrogen Overvoltage on the Constant-Rate Dropping Mercury Electrode. (In German.) *Collection of Czechoslovak Chemical Communications*, v. 16, Feb. 1, 1951, p. 1-12.

Describes experimental and theoretical study of effect of neutral salts, several metals, and various heights of mercury tank, flow rate, concentration of hydrogen ions, gelatines, and several organic dyes on above. Results are graphed and tabulated. 11 ref.

403* A New Process for Identifying Alkyl Groups Combined With Oxygen or Nitrogen. (In German.) M. Jurecek and M. Vecera. *Collection of Czechoslovak Chemical Communications*, v. 16, Feb. 1, 1951, p. 92-94.

Procedure of above is described in detail. Data are tabulated. 10 ref.

404* Chemical Identification by a Physical Method. Mary W. Porter. *Endeavour*, v. 10, Oct. 1951, p. 188-193.

Explains in some detail a method for the identification of crystalline substances. Diagrams and tables.

405* Modern Techniques in Petroleum Testing. III. Gas Analysis—Other Than by Light Absorption Methods. K. R. Garrett. *Institute of Petroleum Review*, v. 5, Oct. 1951, p. 349-357.

41 references.

406* Application of Continuous Infrared Analyzers. J. M. Devine. *Instruments*, v. 24, Nov. 1951, p. 1296-1299, 1340; disc., 1340-1341.

The various types of non-dispersive infrared analyzers are discussed, including how an infrared analyzer is set up and calibrated for application to a multi-component system.

407* The Microwave Spectograph. It's Use as an Analytical Instrument. R. H. Hughes. *Instruments*, v. 24, Nov. 1951, p. 1352-1358; *I.S.A. Journal*, v. 7, Nov. 1951, p. 128-134.

Presents an extensive and thorough discussion of microwave spectroscopy, including a history of its development and use, theory of operation, and description of working models, as well as the use of this type of spectrograph in qualitative and quantative analysis. Equations are given for absorption coefficients in single and multi-component mixtures, with discussions of their significance in application. 16 ref.

408* The Determination of Total Sulphur in Coal: Comparison of Eschka and Strambi Methods. I. Davies and P. J. Jackson. *Journal of Applied Chemistry*, v. 1, suppl. issue no. 1, 1951, p. S4-S7.

A serious discrepancy was found between the two methods; this has been traced to one point of technique in the Strambi method. A modification was made to the latter method which enables it to give results in agreement with the Eschka method.

409* The Determination of Carbon Monoxide by Means of Iodine Pentoxide. E. G. Adams and N. T. Simmons. *Journal of Applied Chemistry*, v. 1, suppl. issue no. 1, 1951, p. S20-S40.

Difficulties in the application of I_2O_5 to the determination of CO in mine air, Diesel exhaust gas, coal gas, etc., are reviewed. Preparation of pure iodic acid and fully reactive I_2O_5 is discussed. A trouble-free purifying and drying train, employing solid reagents only, for removal of interfering gases, is described; and the effect of lower paraffinic hydrocarbons is discussed. 22 ref.

410* Identification and Tests for Homogeneity of Alcohols by Means of the Nitrophenylhydrazones of Their Acetoacetates. M. F. Carroll. *Journal of Applied Chemistry*, v. 1, Oct. 1951, p. 443-446.

A new method for identifying alcohols is described and shown to be a fairly general application. The method may also be used to give an approximate estimate of the homogeneity of commercial alcohols.

411* Decomposition of Calcium Metaphosphate for Determination of Total P_2O_5. J. A. Brabson and O. W. Edwards. *Journal of the Association of Official Agricultural Chemists*, v. 34, Nov. 15, 1951, p. 771-777.

Describes a study of the applicability of A.O.A.C. and other procedures in the decomposition of calcium metaphosphate alone and in mixed fertilizers.

412 Substituted Benzidines and Related Compounds as Reagents in Analytical Chemistry. Part I. Solubilities of the Sulphates. Part II. Reaction With Oxidising Agents. Part III. 3-Methylbenzidine and 3:3'-Di-ethylbenzidine as Indicators in Argentometry. Part IV. Naphthidine as Indicator in the Determination of Zinc With Ferrocyanide. Part V. New Indicators for the Microvolumetric Determination of Gold. R. Belcher and A. J. Nutten. *Journal of the Chemical Society*, Feb. 1951, p. 544-551.

413 Analysis of Inorganic Compounds by Paper Chromatography. Part I. Movement of Cations With Complex-Forming Solvent Mixtures. Part II. Analysis of Cations and Anions. F. H. Pollard, J. F. W. McOmie, and I. I. M. Elbeth. *Journal of the Chemical Society*, Feb. 1951, p. 466-474.

The behavior of the 24 cations of the ordinary qualitative tables with a number of different solvent mixtures, alone and with complex-forming reagents was investigated. Three solvent mixtures, butanol-water containing benzoylacetone, collidine-water, and dioxane containing antipyrine, are suggested for the general scheme of qualitative analysis, details of which are given in Part II.

15. *Analysis—Chemical and Physical*

414 Substituted Benzidines and Related Compounds as Reagents in Analytical Chemistry. Part VI. The Precipitation of Tungsten. R. Belcher and A. J. Nutten. **Part VIII. 3:3'-Dimethylnaphthidine as Indicator in the Titration of Zinc With Ferrocyanide.** R. Belcher, A. J. Nutten, and W. I. Stephen. *Journal of the Chemical Society,* June 1951, p. 1516-1521.

In Part VI, the tungsten-precipitating properties of benzidine, diphenyline, and certain substituted benzidines, and related compounds were examined. It was found that 1-amino-4-p-aminophenylnaphthalene precipitated W quantitatively from acid solution and gave a complete separation from Mo. In Part VII, properties of the compound indicated in the title as an indicator in the titration of Zn with ferrocyanide were investigated. It is more sensitive than naphthidine and the end-point can be detected readily.

415 The Analysis of Inorganic Compounds by Paper Chromatography. Part IV. An Extended Scheme for the Qualitative Analysis of an Unknown Mixture of Cations. F. H. Pollard, J. F. W. McOmie, and H. M. Stevens. *Journal of the Chemical Society,* July 1951, p. 1863-1865.

The scheme of analysis described in Part III is extended to include Ce, Li, Mo, Tl, Ti, U, V, and W.

416 The Alkalimetric Determination of Metals With the Aid of Acid-Base Indicators. Part II. J. F. Coetzee. *Journal of the Chemical Society,* Aug. 1951, p. 2098-2102.

Deals with the determination of Zn, Hg, Cu, and Sb by means of titration with standard alkali, as well as with the alkalimetric analysis of mixtures of Hg and Cu with Cd or Co.

417 The Separation of Acids by Paper Partition Chromatography. A. G. Long, J. R. Quayle, and R. J. Stedman. *Journal of the Chemical Society,* Aug. 1951, p. 2197-2201.

The use of various basic solvent systems for paper partition chromatography of certain organic acids was investigated, and a method evolved for their separation. The study was extended to include anions of amino acids and of inorganic, partly esterified phosphoric and sulfonic acids, as well as phenols and metallic cations. Application of the method to oxidative degradation studies is indicated.

418 Measuring the Water Vapor Content of Gases Dehydrated by Triethylene Glycol. Irwin Politziner, F. M. Townsend, and L. S. Reid. *Journal of Petroleum Technology,* v. 3, Nov. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 192, 1951, p. 301-304.

Data are extensively tabulated and charted.

419* Thorium: Its Determination & Separation From Uranium. M. Venkataramaniah, C. Lakshman Rao, and BH. S. V. Raghava Rao. *Journal of Scientific & Industrial Research,* v. 10B, Oct. 1951, p. 254-255.

The use of benzoic acid as a reagent for the separation of Th from U is described. Double precipitation is necessary to effect complete separation, and quantities as small as 14 mg. of ThO_2 in admixture with 1,400 mg. of U_3O_8 can be quantitatively separated.

420 The Absorptiometric Determination of Magnesium. A. Bacon. *Metallurgia,* v. 44, Oct. 1951, p. 207-211.

Describes an investigation of the use of Titan Yellow and Solocrome Cyanine R. S. as reagents for the above. A method is described for rapid determination of Mo in Al alloys using Solocrome Cyanine R. S. Graphs show effects of various factors.

421 The Spectrographic Determination of Alumina in Silica Brick. W. S. Sykes and D. Manterfield. *Metallurgia,* v. 44, Oct. 1951, p. 267-270.

A simple method of determining the Al content of silica bricks by spectrographic means is described, having an accuracy of the order of ±0.05% Al. The method may also have possibilities for use in spectrographic analysis of other oxide-bearing materials such as slags. Data are tabulated.

422 The Determination of Iron, Nickel and Manganese in Copper Base Alloys. G. W. C. Milner and H. Groom. *Metallurgia,* v. 44, Oct. 1951, p. 271-275.

Absorptiometric methods are described for the individual determination of Fe, Ni, and Mn in most types of Cu-base alloys. A composite scheme is also described for determination of these elements from a single sample weight which is advantageous for alloys requiring determination of all 3 elements.

423* Determination of Manganese in Ferro-Alloys and in Manganese Ores by Direct Oxidation With Silver Peroxide. (In Italian.) D. Rosi and I. Mendola. *Metallurgia Italiana,* v. 43, Oct. 1951, p. 443-445.

20 references.

424 Spectrochemical Analysis of Bronze by a Porous Electrode Method. Bourdon F. Scribner and John C. Ballinger. *Journal of Research of the National Bureau of Standards,* v. 47, Oct. 1951, p. 221-226.

425 Spectrophotometric Determination of Bismuth in Lead-Base and Tin-Base Alloys. Bruce B. Bendigo, Rosemond K. Bell, and Harry A. Bright. *Journal of Research of the National Bureau of Standards,* v. 47, Oct. 1951, p. 252-255.

426 Quantitative Chromatographic Separation and Estimation of Cadmium in Copper Alloys Using Paper Strips. R. L. Davies. *Nature,* v. 168, Nov. 10, 1951, p. 834.

Method for the above is described briefly.

427 A Rapid Method for the Determination of Nucleic Acid Components by Paper Partition Chromatography. Jan-Erik Edström. *Nature,* v. 168, Nov. 17, 1951, p. 876-877.

Describes the above—a simple and sensitive method for rapid analysis in routine work.

428* A New Automatic Radioassayer. Saul J. Harris and Anthony Del Duca. *Nucleonics,* v. 9, Nov. 1951, p. 60-64.

A simple inexpensive sample changer for the radioassay of many similar samples was developed. The device will restack the samples in order after counting. Circuity for use with the unit was developed and is also described.

429 A Rapid Method for the Detection of Drier Metals in Oils and Varnishes. R. M. Lavender. *Paint Technology,* v. 16, Oct. 1951, p. 427-432, 436.

The above is described which precipitates the metals as oxalates and analyzes them by spot tests. Data are tabulated.

430 Alpha-Particle Assay and the Measurement of the Thorium-Uranium Ratio in Radioactive Ores. D. H. Peirson. *Proceedings of the Physical Society,* v. 64, sec. B, Oct. 1, 1951, p. 876-888.

The measurement of the alpha-particle activity of a "thick" radioactive source containing the natural radioactive series is discussed. Two methods of determining the Th-U ratio are considered for use in ore or mineral assays.

431* Solvent Extraction and Its Applications to Inorganic Analysis. H. M. Irving. *Quarterly Reviews,* v. 5, no. 2, 1951, p. 200-226.

102 references.

432* Colorimetric Determination of Cyanide. J. M. Kruse and M. G. Mellon. *Sewage and Industrial Wastes,* v. 23, Nov. 1951, p. 1402-1407.

Gives details of procedure developed for determining cyanide in sewage and electroplating wastes.

433* Method of Determination of Carbon and Hydrogen in Nitrogen-Containing Substances, Without Using Lead Dioxide. (In French.) R. Berret and P. Poirier. *Bulletin de la Société Chimique de France,* Sept.-Oct. 1951, p. 724-727.

Describes and diagrams novel combustion-train procedure, in which only copper oxide and silver oxide are used. Results are said to be more accurate.

434* Iodometric Determination of Tin in the Presence of Copper (Bronzes, Zines). (In French.) M. L. Malprade. *Bulletin de la Société Chimique de France,* Sept.-Oct. 1951 p. 739-741.

Gives details of procedure. Typical results are tabulated.

435* Determining Trace Amounts of Boron in Aqueous Samples for Agricultural Purposes. Gunter Pichotta. *Zeit-*

schrift für Pflanzenernährung; Düngung; Bodenkunde, v. 54(99), no. 2, 1951, 146-149.

Procedure of above, performed with a new dye "Chromotrop 2B," is described in detail.

Books

436 Microdiffusion Analysis and Volumetric Error. Ed. 3. Edward J. Conway. 391 pages. 1950. Crosby Lockwood & Son, Ltd. (QD98 C76m3)

Describes quantitative and qualitative methods of analysis with the microdiffusion unit. Compares them with general methods and apparatus. Most of the work deals with biological applications.

See also:
191 (analysis of electroplating baths)
451 (mass spectrometry—recent developments)
695 (iodine-value determination on insulating oils)
772 (analysis of Cu acetylide)
992 (water content of electrical insulation)

16. APPARATUS, METHODS, AND STANDARDS

437* Use of an Ethoxyline Resin in Three-Dimensional Photoelasticimetry According to a Solidification Technique. (In French.) Michel Ballet and Gaston Mallet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 15, 1951, p. 846-847.

Reports on a study of the above in comparison with a similar study by N. C. Foster. Illustrated. Data are tabulated.

438* An Effusiometer for Measuring Gas Densities in Continuous Flow Systems or in Closed Systems. K. H. Jack. *Analyst*, v. 76, Oct. 1951, p. 613-615.

Described and diagrammed.

439* Photometric Measurement of Particle Size and Relative Surface Area. R. J. T. Charles. *Canadian Mining and Metallurgical Bulletin*, v. 44, Nov. 1951, p. 722-729; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, 1951, p. 452-459.

An apparatus that will measure the surface area of a few of the simple minerals with a high degree of accuracy is described. Apparatus consisted essentially of a photometric device that will measure the turbidity of fine-particle suspensions. Diagrams. Data are tabulated.

440 High-Speed Relays in Electric Analogue Computers. R. R. Bennett and A. S. Fulton. *Electrical Engineering*, v. 70, Dec. 1951, p. 1083. (Condensed from paper to be published in *AIEE Transactions*, v. 70, 1951.)

Considers applications of a comparison operation which consists of a comparison of two quantities followed by one or more of the 7 basic operations.

441* Critical Evaluation of Potentiometers. E. B. Steinberg. *Electrical Manufacturing*, v. 48, Dec. 1951, p. 96-101, 236-237.

Analysis of both standard commercial, precision and special-purpose types from the standpoints of construction, performance, range of applicability, cost, and some common limitations encountered by design engineers.

442* Precise Temperature Control. Charles F. Rains and Robert C. McMaster. *Electrical Manufacturing*, v. 48, Dec. 1951, p. 110-113, 250-252, 256.

Discusses thyratron temperature regulator which provides an extremely fast and sensitive control for conduction-heating currents. Facilitates accurate control of temperature for investigating material properties at high temperatures. Diagrams and bibliography on applied electronics.

443 Feedback Photometer Speeds Light Measurements. John E. Tyler. *Electronics*, v. 24, Dec. 1951, p. 92-93.

In the system described, two lamps in out-of-phase oscillation indicate bridge unbalance and also serve as two-light source for comparison measurements. Versatile optical system provides means for spectrophotometric, colorimetric, reflectance, and transmission measurements.

444 Thyratron-Controlled Vibration Drive. Lloyd W. Allen. *Electronics*, v. 24, Dec. 1951, p. 106-108.

Describes simple and inexpensive electromagnetic drive furnishing power during part of displacement cycle only which may be used to life-test aeronautical and other structures. Ordinary audio signal generator and pulse-shaping circuit furnish control pulses for the thyratron.

445 Electronic Weighing System. *Electronics*, v. 24, Dec. 1951, p. 136.

Describes and diagrams compact electronic scale and recorder, developed by the Streeter-Amet Co., Chicago. It may be installed at more convenient weighing points than is possible with a bulky lever system. Also, the scale is able to record and print the weight information at some point remote from the scale.

446* Simple Method of Comparing Manometers. J. H. Preston. *Engineering*, v. 172, Nov. 23, 1951, p. 645-646.

Discusses the above in measurements connected with fluid flow.

447* Magnetically-Operated Temperature-Detection Switch. *Engineering*, v. 172, Nov. 23, 1951, p. 671.

Describes and diagrams the above which employs a fixed temperature-sensing element held in contact with a permanent magnet by mutual attraction. Diagram is given.

448 Automatic Conveyorized Unit Used in Black-Light Inspection. *Foundry*, v. 79, Dec. 1951, p. 102-103, 225.

Describes a specially designed automatic conveyorized Zygol unit developed and furnished by Magnaflux Corp. It was installed for receiving inspection of assorted malleable and gray iron castings received at Caterpillar.

449 Review of Present-Day Steel Foundry Radiographic Practice. G. M. Michie. *Foundry Trade Journal*, v. 91, Nov. 29, 1951, p. 615-624; disc., p. 624-626.

Surveys development and present status of the above, with emphasis on safety precautions and on the wider application of the process made possible by the availability of cheap radioactive isotopes.

450 Precision Bridges for Instrument Transformer Testing. R. W. Knowles and N. T. Kohlhardt. *General Electric Review*, v. 54, Nov. 1951, p. 14-17.

Describes, diagrams, and illustrates the above. Discusses their applications.

451 Recent Developments in Mass Spectrometry. J. G. Hutton and T. E. Usher. *General Electric Review*, v. 54, Nov. 1951, p. 18-23.

Surveys the above. Diagrams and illustrations.

452 Miniature Force-and-Pressure Cells. H. F. Rondeau. *General Electric Review*, v. 54, Nov. 1951, p. 24-26.

Describes developmental considerations including size, shape, material, surface finish, and lubrication of the above—designed to be a valuable tool in the measurement of force and pressure.

453 A Simplified Portable Oscillograph. J. L. Paine and D. M. Ihle. *General Electric Review*, v. 54, Nov. 1951, p. 42-45.

New features make possible quick on-the-spot records, as well as the usual records of longer-duration phenomena, in a simplified electromagnetic instrument designed for a wide range of practical applications.

454 New Electric Calculator Solves Piping Problems. *Heating, Piping & Air Conditioning*, v. 23, Dec. 1951, p. 86-87.

Describes a distribution system calculator which in the space of a few hours performs calculations of flow patterns and pressures, eliminating days or weeks of study required to obtain similar data by other means. Constructed primarily for investigating gas systems, it can also be used in steam-distribution work.

455* A Diamond Bomb for Obtaining Powder X-Ray Pictures at High Pressures. A. W. Lawson and Ting-Yuan Tang. *Industrial Diamond Review*, new ser., v. 11, Oct. 1951, p. 213.

Described and diagrammed.

16. *Apparatus, Methods, and Standards*

456 A General Theory of Sampling Servo Systems. D. F. Lawden. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 4, Oct. 1951, p. 31-36.

A comprehensive mathematical theory of servo systems in which the difference between input and output quantities is examined discontinuously at the ends of equal intervals of time is developed, and general formulas are obtained from which the behavior of any particular system may be deduced. These results are applied to obtain the fundamental equations of the two particular types of system which have been developed practically. Two examples of typical elementary systems are analyzed. Recommendations for future work are given.

457 A Circuit for Generating Polynomials and Finding Their Zeros. F. W. Bubb, Jr. *Proceedings of the I. R. E.*, v. 39, Dec. 1951, p. 1556-1561.

Describes an instrument for generating any polynomial and for finding the roots of any polynomial equation to any desired degree of accuracy.

458 Xeroradiography Can Cut X-Ray Inspection Costs. M. D. Phillips and S. A. Wenk. *Iron Age*, v. 168, Nov. 39, 1951, p. 86-89.

Describes use of above, new dry radiographic process which has several advantages in industrial radiography. Plates are used repeatedly and are not spoiled by accidental exposure to light, X-rays, or nuclear radiation. The image may be quickly developed by a simple method and transferred to ordinary paper.

459 New Camera Takes 100,000 Frames Per Second. *Iron Age*, v. 168, Dec. 6, 1951, p. 153.

Describes a new camera, developed by Battelle Memorial Institute, Columbus, Ohio, designed to take pictures at speeds about 10 times the speed of most commercial high-speed cameras.

460 A Period Immersion Pyrometer. R. F. Wright and E. Scorah. Appendix: An Alternative Method, T. Land and R. Barber. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 243-244.

A method of period immersion pyrometry was developed for use on high-frequency furnaces using normal types of immersion pyrometer, fitted with fused alumina dipping tubes, which are coated with alumina cement to minimize heat shock. Immersion periods of up to 2 hrs. were obtained. Experiments on other uses of the technique are mentioned. In the appendix, the alternative apparatus is briefly described and diagrammed.

461 Pyrometers for Surface-Temperature Measurement. M. D. Drury, K. P. Perry, and T. Land. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 245-250.

Describes 3 improved pyrometers designed to measure the temperature of hot surfaces in cool surroundings, with particular reference to the requirements of the steel industry. Diagrams.

462* A Magnetic Stirrer for Vacuum Work. D. Michell. *Journal of Applied Chemistry*, v. 1, suppl. issue no. 1, 1951, p. S8-S9.

Describes and diagrams small shaded-pole induction motor, the glass-enclosed Fe-Cu rotor of which is attached to a stirrer inside a vessel, while the stator is outside.

463* The Measurement of Particle-Size Distribution by Sedimentation Methods. E. H. Amstein and B. A. Scott. *Journal of Applied Chemistry*, v. 1, suppl. issue no. 1, 1951, p. S10-S20.

Results are confined to the pipette method of sampling a suspension. The importance of dispersion is stressed, and tests are described for the determination of adequacy of dispersion, based on microscopic examination, observation of rheological behavior, and qualitative and quantitative sedimentation. Effect of partial flocculation on sedimentation results is demonstrated. Results for calcined alumina, hydrated alumina and carbon powders are presented and discussed.

464* Determination of the Particle Size of Fine Powders, With Particular Reference to Kaolins. Corrado Rossi and Ruffo Baldacci. *Journal of Applied Chemistry*, v. 1, Oct. 1951, p. 446-452.

Sedimentation curves for suspension of kaolins from Central Europe, Italian bentonites, and clays were obtained by using a hydrostatic balance provided with a normal plunger. Investigations undertaken to establish the accuracy of the method and the theoretical calculation of the sedimentation curves is briefly described. The possibility of applying Stokes' law to the mass settling of kaolins is also discussed.

465 The Use of Single-Crystal Neutron Diffraction Data for Crystal Structure Determination. S. W. Peterson and Henri A. Levy. *Journal of Chemical Physics*, v. 19, Nov. 1951, p. 1416-1418.

Reports preliminary results of a series of empirical tests on the feasibility of utilizing single-crystal neutron-diffraction data. Intensities from NaCl, KCl, KBr, KHF, and NH_4Cl single crystals yield correct structure factors without extinction corrections with an accuracy ample for structural purposes. However, intensities from the strong reflections of CaF_2, $CaCO_3$, and LiF yield structure factors which are substantially low and appear to be significantly affected by extinction.

466 The Application of Radioactive Indicators in Biochemistry. G. C. Hevesy. *Journal of the Chemical Society*, June 1951, p. 1618-1639.

Faraday Lecture. 58 ref.

467 A Vibrating-Plate Viscometer. J. G. Woodward. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 481-491.

Discusses characteristics of the above.

468 Vacuum Physics. *Journal of Scientific Instruments*, Supplement 1, 1951, 80 pages.

Papers presented at a symposium held by Midland Branch of The Institute of Physics in Birmingham, England, June 27-28, 1950. Consists of the following papers: "Modern Vacuum Pumps," D. R. Goddard; "The Design of Industrial Vacuum Systems," T. S. Millen; "Review of Vacuum Gauges," W. Steckelmacher; "General Principles of Leak Detection," J. Blears and J. H. Leck; "A Cold-Cathode Mass Spectrometer Leak Detector," C. J. Milner; "Application of the Mass Spectrometer to High Vacuum Problems," J. Blears; "Large Scale Vacuum Dehydration," D. R. Goodard; "The Vacuum System of the Birmingham Proton Synchrotron," L. Riddiford; "Recent Advances in Vacuum Coating Plant and Techniques," L. Holland; "Melting and Sintering of Metals in Vacua," E. D. Malcolm; "Freeze Drying—Vacuum Sublimation," L. G. Beckett.

469 How to Evaluate Shock Tests. Charles E. Crede. *Machine Design*, v. 23, Dec. 1951, p. 149-153.

Discusses various methods used in the above; each method subjects the equipment under test to an impulsive change in velocity.

470 Eliminating Friction From Torque Measurements. H. Grady Rylander. *Machine Design*, v. 23, Dec. 1951, p. 161-162.

Describes an instrument arrangement and strain-gage circuit for the above. Shows application to a bearing-test machine.

471 Notes on Pyrometry. Gerard M. Wolten. *Metal Progress*, v. 60, Nov. 1951, p. 91-92.

Discusses sensing elements of temperature measuring devices. Factors such as heat imput, heat loss, and heat exchange are discussed as affecting thermocouple determinations. Various forms of pyrometers are described.

472 Fluoroscopic Inspection of Light Metal Castings. Justin G. Schneeman and T. E. Piper. *Metal Progress*, v. 60, Nov. 1951, p. 93-96.

Describes the above presenting the major limiting factors. Safety requirements needed in its use are discussed. Various applications are given.

473* Measuring the Thickness of Layers or Thin Films. (In French.) Rudolph Berthold. *Metaux: Corrosion—Industries*, v. 26, Sept. 1951, p. 369-374.

Discusses the above with respect to thin films and sheets up to 1 mm. thick, linings over 1 mm. thick, and ferromagnetic and non-ferromagnetic layers. Includes charts, diagrams, and photographs.

474 Correcting for Density and Viscosity of Incompressible Fluids in Float-Type Flowmeters. Montgomery R. Shafer, Ernest F. Fiock, Harry L. Bovey, and Ross B. Van Lone. *Journal*

of Research of the National Bureau of Standards, v. 47, Oct. 1951, p. 227-238.

Procedures are described whereby, after calibration of a metering tube with a few fluids of known physical properties, accurate corrections may be calculated from any fluid whose properties lie within the range embraced by the calibration fluids. Application of the proposed method of calibration and correction to the 5 metering tubes studied gave corrected values of flow that were always within ¾% of the true values.

475* A Magnetic Tape "Memory" for SEAC. *Technical News Bulletin* (National Bureau of Standards), v. 35, Nov. 1951, p. 161-163.

Describes a computer-controlled external auxiliary "memory" using magnetic tape as the recording medium. Illustrations.

476 Simple Equipment to Estimate Radiocarbon. *Nature*, Oct. 6, 1951, p. 599.

Describes and diagrams low-pressure argon-alcohol counting tube of very satisfactory performance for radioactive CO_2.

477 A Fast Continuous Electrodialyser for Hydrophilic Colloids, and a Fast Continuous Electrodecanter for Hydrophobic Colloids. A. J. Rutgers and R. Swyngedouw. *Nature*, v. 168, Oct. 27, 1951, p. 727-728.

478 Improving the Performance of a Littrow-Type Infra-Red Spectrometer. *Nature*, v. 168, Nov. 3, 1951, p. 785-786.

In a recent communication, A. Walsh suggested a means of improving the performance of a commercial infrared spectrometer by adding extra plane mirrors so that the radiation traverses the prism 4 times instead of twice, and then chopping the partly dispersed radiation so that only the wanted radiation is interrupted and consequently measured. Points out that similar ideas have been suggested previously, and describes an alternative and perhaps simpler way of applying them to existing spectrometers.

479 A Highly Sensitive Phase-Contrast Refractometer for Liquids and Gases. Erik Ingelstam. *Nature*, v. 168, Dec. 1, 1951, p. 960.

Describes the above with an accompanying diagram.

480 A New Surface Viscometer. W. E. Ewers and R. A. Sack. *Nature*, v. 168, Dec. 1, 1951, p. 964.

Describes and gives a brief mathematical treatment of a method to measure the viscosity of dilute soluble films.

481* Tripartite Instrumentation Conference—1951. Denis Taylor. *Nucleonics*, v. 9, Dec. 1951, p. 5-12.

Surveys the above. Discussions centered, generally, on counting-rate meters, low-background counting apparatus, new techniques for scaling, millimicrosecond techniques, automatic counting apparatus, pulse-amplitude analyzers, and light weight radiation-monitoring instruments. Illustrations, diagrams. 15 ref.

482* Fatigue Effects in Scintillation Counters. L. Reiffel, C. A. Stone, and A. R. Brauner. *Nucleonics*, v. 9, Dec. 1951, p. 13-15.

The precision of quantitative results from high-rate counting with scintillators may be seriously affected by fatigue in the photomultiplier. Data on counting-rate stability for 5819 tubes were used to define optimum operating conditions. Data are graphed.

483* A Pulse-Height Distribution Analyzer. William E. Glenn. *Nucleonics*, v. 9, Dec. 1951, p. 24-28.

Describes the above giving circuit diagrams. Applications for the analysis of gamma-ray spectra and alpha-particle energies are given.

484* Measurement and Handling of Radioactive Materials for Therapeutic Use. W. K. Sinclair. *Nucleonics*, v. 9, Dec. 1951, p. 35-42.

Present techniques used in the measurement of radioisotopes for therapeutic purposes are limited in accuracy. The importance of absolute measurements and the requirement of calibrated instruments are discussed. The methods used at a British hospital to overcome measurement and handling difficulties are outlined.

485* Design of Directional Counters for Clinical Use. Brian D. Corbett and A. J. Bonour. *Nucleonics*, v. 9, Nov. 1951, p. 43-53.

Collimated counters are useful tools in medical research with gamma-emitting radioisotopes. Design factors are discussed with particular reference to a small G-M counter for clinical use with radioiodine. Diagrams and graphs. 25 ref.

486* Some Industrial Applications of Radioelements Made at the Commissariat á L'Energie Atomique. Jules Gueron. *Nucleonics*, v. 9, Nov. 1951, p. 53-59.

The French counterpart of the U.S. AEC is actively engaged in showing industry how radioactivity can solve some of its problems. Six specific problems, methods of attack, and results are discussed.

487 Ambient Temperature Independent Thermopiles for Radiation Pyrometry. William G. Fastie. *Journal of the Optical Society of America*, v. 41, Nov. 1951, p. 823-829.

Experimental and theoretical analyses were outlined which have formed the basis for several designs for thermopiles whose voltage output is not affected by ambient temperatures below 225°F. The techniques described are applicable to other types of radiation thermopiles and to bolometers, the analysis prescribing the ambient temperature limits and source temperature limits between which satisfactory performance may be anticipated.

488* Collimating X-Rays in Beams of Very Small Divergence and High Intensity. J. A. Lely and T. W. van Rijssel. *Philips Technical Review*, v. 13, Oct. 1951, p. 96-103.

When X-rays fall upon a polished surface at a very small angle, total reflection may take place. Use was made of this principle in constructing an "X-ray lens" and an X-ray microscope. It also made possible production of a simple collimating system for producing an X-ray beam with very small divergence, a relatively high intensity, and very little scattered radiation.

489 A Nomogram for Photographic Spectrophotometry. J. Noar. *Photographic Journal*, v. 91B, Sept.-Oct. 1951, p. 99-101.

A nomographic method is described which simplifies the treatment of photographic data for spectrophotometry. Separate nomograms are needed for each set of emulsion response parameters, and a chart is described which facilitates nomogram construction from a few calibration data.

490 Betatron Radiography. D. G. Wyatt. *Photographic Journal*, v. 91B, Sept.-Oct. 1951, p. 102-105.

Describes technique used in radiographing a steel object (a lathe chuck) with 9.6 Mev. betatron radiation.

491 Mass Measurements With a Magnetic Time-of-Flight Mass Spectrometer. E. E. Hayes, P. I. Richards, and S. A. Goudsmit. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 824-829.

The above was used to measure the time of flight of ions for a number of complete revolutions in a magnetic field. This spectrometer is especially suitable for heavy masses.

492 A Geiger Counter Spectrometer for Soft X-Rays. J. L. Robers, and F. C. Chalklin. *Proceedings of the Physical Society*, v. 64, sec. A, Oct. 1, 1951, p. 935-936.

Describes the above. It appears that the apparatus should be of value for absorption as well as emission spectroscopy.

493 A Simplified Shearing Interferometer. R. L. Drew. *Proceedings of the Physical Society*, v. 64, sec. B, Nov. 1, 1951, p. 1005-1010.

A new design of interferometer based on the wave-front shearing principle is described and illustrations given of its application to the solution of a variety of "through-type" and autostigmatic testing problems.

494 Evaluation of Automatic Computing Machines. Franz Alt. *Product Engineering*, v. 22, Nov. 1951, p. 146-152.

The principal types of automatic computers are described and illustrated.

16. *Apparatus, Methods, and Standards*

495 Electronic Instruments for Mechanical Measurements. J. L. Murphy. *Product Engineering*, v. 22, Nov. 1951, p. 153-159.

While the discussion deals with instrumentation for measuring strain; with proper design, the strain in the gage can be proportional to basic mechanical quantities such as displacement, velocity, acceleration, torque, force, and temperature. Circuit and schematic diagrams.

496* The M.I.T. Laboratory of Cryogenic Engineering. S. C. Collins, W. C. Nason, Jr., and R. L. Cannaday. *Refrigerating Engineering*, v. 59, Dec. 1951, p. 1179-1182.

Surveys the above. Equipment includes liquid-nitrogen plant, helium refrigerator, helium liquefier, and a tensile-testing machine to study stresses of metals at very low temperatures.

497* Recording Ultra Rapid Changes in Temperature. B. Luyet and F. Gonzales. *Refrigerating Engineering*, v. 59, Dec. 1951, p. 1191-1193, 1236.

Describes a detecting and recording instrument used to measure a change of several hundred degrees per second. Graphs and diagrams.

498 Statistical Quality Control of Metalworking Operations. Parts III and IV. Lester F. Spencer. *Steel Processing*, v. 37, Oct. 1951, p. 506-508; Nov. 1951, p. 567-568, 576.

Discusses use of control charts for the above. Advantages and disadvantages are summarized. 16 ref.

499 A.S.T.M. Specifications for Soft Solder Metal. The Melting Range of Tin-Lead Solders. *Tool Engineer*, v. 27, Dec. 1951, p. 53-54.

Presents tabular data on the above.

500* Application of Optical Absorption in the Extreme Ultraviolet to the Detection of Leaks in Vacuum Apparatus and to the Measurement of Low Pressures. (In French.) Jacques Romand, Vladimir Schwetzoff, and Boris Vodar. *Vide*, v. 6, July-Sept. 1951, p. 1046-1051.

Presents results of experiments on the above. Includes diagrams and photographs. 15 ref.

501* Nondestructive Crack-Detection Method Using Radioactive Indicators. (In German.) K. Kaindl and A. Mathiaschitz. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 368-369.

Describes above method and illustrates typical results on different steels by means of micrographs and macrographs.

502* Measuring Density of Gases With Corpuscular Ray Probes. (In German.) E. Schopper and B. Schumacher. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 700-705.

Proposed method is based on the absorption of corpuscular-ray bundles by highly dilute gases. Apparatus and procedure are described and illustrated; results are graphed and tabulated. 15 ref.

503* Generation of Very High Temperatures in the High Power Spark. (In German.) G. Glaser. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 706-713.

Tells how the electric spark may be used to produce temperatures up to 40,000° K. Apparatus is diagrammed; data are graphed and tabulated. 16 ref.

Miscellaneous Publications

504 A Multiple-Range Self-Balancing Thermocouple Potentiometer. I. Warshawsky and M. Estrin. National Advisory Committee for Aeronautics, Research Memorandum E51H31, Nov. 5, 1951, 15 pages. (TL782 Un3rm)

The above is described that provides automatic measurement of temperatures or temperature differences with any one of several thermocouple-material pairs. Techniques of automatic reference-junction compensation, span adjustment, and zero suppression are described that permit rapid selection of range and wire material, without the necessity for restandardization, by setting of two external tap switches. Diagrams.

505 A Pre-Loaded Spring Accelerometer for Shock and Impact Measurements. D. E. Hudson and O. D. Terrell. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 1-10. (TG265 So13p)

Describes the above with which accelerations from 25 to 1300 g can be recorded versus time. The calibration of this type of accelerometer is discussed and typical results are given. Diagrams.

506 A New High-Speed Camera. Ivan J. Taylor. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 93-96. (TG265 So13p)

A new type of general purpose streak camera was developed utilizing the magnetic fluid clutch to attain film speeds up to 35 ft. per sec. in less than 35 millisec., or 6 in. of film travel. The camera may be operated several times without reloading, as complete and comprehensive recordings are obtainable on less than 24 in. of film. Illustrations.

507 Some Unorthodox Procedures in Photoelasticity. A. J. Durelli and Rex L. Lake. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 97-122. (TG265 So13p)

The above is concerned with a description of a diffused light polariscope and a discussion of some simplified techniques which, it is hoped, will make possible the production of stress patterns of reasonable good quality by those who have neither the time nor the inclination to develop the skills required by conventional methods. Creep properties in photo-formaldehyde plastics are described and used in 2-3 dimensional photoelasticity. Data are tabulated. Illustrations. 10 ref.

508 Characteristics of Wire Gages Under Various Conditions. Harry Majors, Jr. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 123-139; disc., p. 139-140. (TG265 So13p)

Discusses an experimental program in which the variation of gage sensitivity from −310°F. to 140°F. is reported for wire gages type A-3 and A-15 mounted on steel and constantan beams, respectively. Data are tabulated and graphed. Illustrations. 52 ref.

508a Characteristics of Electric Strain Gages at Elevated Temperatures. Emmett E. Day. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 141-150. (TG265 So13p)

Presents results of a test in which the gage factor was checked against temperature for 21 commonly used commercial SR-4 strain gages.

509 An Optical Strain Gage for Use at Elevated Temperatures. P. R. Weaver. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 159-162. (TG265 So13p)

The optical gage described is capable of operating at temperatures up to 500°F. It was designed and developed at the National Bureau of Standards for use in determining mechanical properties and for evaluating the performance of remote-reading strain gages at high temperatures.

510 Resistance Wire Strain Gages in Product Development. W. H. Buckley and R. G. Anderson. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1 1951, p. 177-190. (TG265 So13p)

Describes some applications of Baldwin SR-4 resistance-wire strain gages in product-development engineering, as well as some suggested methods and limitations in their use. Illustrations and diagrams.

511 A Wire Resistance Strain Gage for the Measurement of Static Strains at Temperatures Up to 1600°F. J. E. Carpenter and L. D. Morris. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 191-200. (TG265 So13p)

Deals with the application of high-temperature, wire-resistance strain gages to static testing and is primarily concerned with the techniques and apparatus used in fabricating and instrumenting the gage. The gage properties and some test results obtained by its use are included. Diagrams and graphs.

Books

512 Das Trockengleichrichter Vielfachmessgerät. (Dry-Cell-Rectifier Multiple Measuring Instruments.) 144 pages. 1950. Springer-Verlag, Vienna, Austria. (TK321 W14t)

Description of physical principles, design, characterized properties, and typical uses of above includes diagrams and graphs.

513 Phase Microscopy; Principles and Applications. Alva H. Bennett, Helen Jupnik, Harold Osterberg, and Oscar W. Richards. 320 pages. 1951, John Wiley & Sons, New York. (QG211 B43p)

In presenting the above material, the authors have individually written the various chapters. In each of these chapters the subject matter relates to the specific type of investigation in which the author concerned has been engaged. Phases covered are theory, instrumentation, techniques in its operation and applications.

See also:

28 (electron microscopy of ores)
102 (temperature control in steel rolling)
185 (Government porcelain-enameling specifications)
268 (thermal-conductivity apparatus)
278 (high-temperature thermal analysis using W-Mo thermocouples)
835 (ultrasonic automobile-tire inspection)
929 (fast-electron losses in proportional counters)
968 (power supplies for digital computers)
975 (servo-system networks)
1027 (Li-Sb photoelectric cathodes)
1034 (vacuum-tube accelerometer)
1037 (time-internal measurement)
1041 (printing from electromagnetic records)

17. METALS—FABRICATION AND USES

514* Aviation Metallurgy Inside the U.S.S.R. Henry Brutcher. *Aero-Digest*, v. 63, Dec. 1951, p. 48, 50, 52.

Presents an indirect review of alloys now being used in Russia for aircraft construction.

515 Noble Metals in Chemical Apparatus; Some Recent German Construction Materials. *Chemical Age*, v. 65, Nov. 10, 1951, p. 627-628.

Reviews recent developments in the above.

516 Developments in the Use of Stainless Steel. John L. Cotsworth. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 66-68.

Surveys the above emphasizing steel-plant applications.

517 Interim Report of Service Trials of Steel Coal Wagons (1939-1950). J. C. Hudson. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 250-256.

Presents report on 4 types of steel plate used in construction of railroad hopper cars: ordinary mild steel, low-Cu steel, Cu-Mn steel, and Cu-Cr steel. Corrosion data and results of metallurgical examination are tabulated.

518* The Application of Sintered Metal for Clutch Facing. *Machinery* (London), v. 79, no. 2035, Nov. 15, 1951, p. 855-858.

Discusses characteristics and advantages of the above. Diagrams and illustrations.

519* Carbides: 1951 Developments for 1952 Applications. *Magazine of Tooling and Production*, v. 17, Dec. 1951, p. 60, 62.

Developments reviewed are successful experimental use of cemented tungsten carbide bearings under high speed, high load, and temperature conditions where conventional bearings fail; and the possibility of being able to hard surface metal parts with a relatively thin "skin" of ultra-hard, wear-resisting tungsten carbide. In the latter process, tungsten carbide is flowed onto metal surfaces using conventional shielded-arc equipment.

520 Manufacturers Designations for Electronic Cores Produced From Metal Powders. *Materials & Methods*, v. 34, Nov. 1951, p. 103.

Correlates basic material designations with manufacturer's names.

521 Metallurgical Considerations in the Use of Aluminum for Cable Sheathing. I. and II. A. Latin. *Metallurgia*, v. 44, Oct. 1951, p. 167-173; Nov. 1951, p. 231-238.

Part I discusses factors of availability of materials, production methods, alloy properties, and sheathing methods (extrusion, die sinking, forming, and welding), and special methods. Part II deals with properties of drawn and extruded tube, corrosion protection, and joining. Illustrations, graphs, and tables.

522 Selection Chart for Investment Casting Alloys. D. V. Ludwig. *Product Engineering*, v. 22, Nov. 1951, p. 203, 205, 207.

Covers light metals, Cu-base alloys, low-carbon and low-alloy ferrous alloys, high-temperature alloys, ferrous tool steels, and stainless steels.

523 The Very Remarkable Performance of Aluminum-Steel Trolley Wires. (In French.) Louis Albert. *Revue de l'Aluminium*, v. 28, Oct. 1951, p. 362-364.

Detailed inspection of above wires, owned by a Paris transit company, showed, after 510,000 trolley passages, that 2,000,000 can be made before the wire wears out, or 4 times as many as possible with electrolytic Cu wire.

524 Dr. Lescoeur's Results in Treatment of Wounds by Application of Aluminum. (In French.) Jean Lescoeur. *Revue de l'Aluminium*, v. 28, Oct. 1951, p. 370-371.

Reports results obtained in about 50 cases of wounds treated by the application of Al. Al foil gummed on glass wool, and also thin sheets of annealed Al, have been used successfully.

525* How to Get Good Sleeve Bearing Life. *SAE Journal*, v. 59, Nov. 1951, p. 40-44. (Excerpts from "Sleeve Bearing—Design, Manufacture & Installation," by Richard J. Schager.)

Discusses the application of various metals in bearings in internal-combustion engines.

526 Adhesive Metal Nameplates Give Permanent Identification. *Steel*, v. 129, Nov. 19, 1951, p. 104.

Millions of paper-thin Al appliques now are being produced for use on hundreds of objects ranging from golf clubs to refrigerators in addition to airplanes. The product, trade-named Metal-Cal, was developed by Boeing Airplane Co., Seattle, to replace conventional paper appliques mounted by the hundreds inside and outside most airplanes. In production forst, a color-retentive coating is created on the surface of the foil by chemical reaction. Printing is then applied by a standard multilith offset process. The processing can be made to reproduce any color.

527* Alloy Steels for Use in Manufacture of Sheet and Formed Glass Products. (In German.) August Dammer. *Werkstoffe und Korrosion*, v. 2, Nov. 1951, p. 409-414.

Discusses steels used for rolls for sheet-glass production, and for molds used in blowing glass containers, dishes, etc. Influence of basic alloys and of structure are discussed and proposals for savings in Ni are made. Tables and graphs.

See also:

94 (investment casting—alloy selection)
101 (rare earths to improve forgeability of stainless steel)
132 (steel, Al, and Cu sheets—applications)
134 (cemented carbides for cutting tools)
140 (applications of stainless-steel powders)
301 (prospects of Mo-base turbine blades)
304 (cermets in rocket and jet propulsion)
326 (magnesium extrusion alloys)
344 (cemented-carbide alloys in Germany)
364 (corrosion-resistant irons and steels)
517 (steel plates in coal cars)
966 (alloys for cathodes)
1067 (lithium in metallurgy)

18. POLLUTION AND WASTES

528* Disposal of Wastes From Water Purification and Softening Plants. *Journal American Water Works Association*, v. 43, Nov. 1951, p. 941-942.

Covers disposal of wastes from filter plants and coagulation basins, cation-exchange (zeolite) softening plants, and lime and lime-soda softening plants.

18. *Pollution and Wastes*

529* Production of Copper Sulphate From Mine-Water Precipitate. A. G. Lyle. *Canadian Mining and Metallurgical Bulletin*, v. 44, Nov. 1951, p. 715-716; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, 1951, p. 445-446.

Outlines the way in which the above was done, and describes the plant and procedure by which $CuSO_4$ is now being made, and by means of which an appreciable saving is being effected. The $CuSO_4$ is used in the mill for recovery of sphalerite by flotation.

530 Bacterial Filtration Efficiency of an Electrostatic Air Cleaner. *Heating, Piping & Air Conditioning*, v. 23, Dec. 1951, p. 84-85.

Effectiveness of an electrostatic air cleaner in removing airborne bacteria from the air passing through it was studied in a recent series of tests made in England. It was found to be relatively easy to remove over 99% of bacteria-carrying particles.

531 Cyanides and the Waste Disposal Problem. George T. Long. *Industrial Heating*, v. 18, Oct. 1951, p. 1744, 1746, 1748, 1922; Nov. 1951, p. 1994, 1996, 1998.

First part discusses political and legal problems, cyanide-salt wastes, new approaches to waste treatment, planning of waste-treatment plants, and standards. Concluding part discusses treatment methods, alkaline chlorination treatment, chemical reactions in waste treatment, colorimeter tests for waste control, and hypochlorite treatment.

532 Waste Treatment in the Modern Steel Mill. J. E. Cooper. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 81-84.

Discusses various functions to be performed in the above.

533 An Electronic Method of Detecting Impurities in the Air. G. Phillips. *Journal of Scientific Instruments*, v. 28, Nov. 1951, p. 342-347.

Diagrams of the above apparatus are given.

534* Some Industrial Waste Treatment Plants in Connecticut. Willis J. Snow. *Sewage and Industrial Wastes*, v. 23, Nov. 1951, p. 1408-1418.

An illustrated review of several of the more successful industrial waste-treatment plants that have been in operation in Connecticut for a number of years. Includes pickle liquor from steel-wire mills, plating-room wastes, metal wastes containing cyanide, and paperboard-mill white water.

535* Design and Operation of a Metal Wastes Treatment Plant. C. M. Gard, C. A. Snavely, and D. J. Lemon. *Sewage and Industrial Wastes*, v. 23, Nov. 1951, p. 1429-1438.

Presents details of design and construction of above plant of Ranco, Inc., Delaware, Ohio. Cleaning and plating operations involved include oil and dirt removal from stampings by washing with an alkaline cleaner, cleaning and acid dips in preparation for plating, zinc and copper plating, and Iridite treatment (chromating) of certain parts. Alden E. Stilson & Associates and Battelle Memorial Institute, both of Columbus, Ohio, worked on the problem.

536* Estimates on the Concentration of Radioiodine in Sewage and Sludge From Hospital Wastes. C. C. Ruchhoft and Sergei Feitelberg. *Nucleonics*, v. 9, Dec. 1951, p. 29-34.

Presents results of a study of the above. Factors that must be considered in estimating possible I^{131} concentrations are considered. Data are tabulated.

537* Pollution Abatement Program at DuPont's Waynesboro Plant. Roy McCracken. *Water & Sewage Works*, v. 98, Nov. 1951, p. 453-457.

Gives details of the above which features waste curtailment through process and equipment changes, rendering treatment of plant effluents unnecessary. The plant manufactures acetate rayon. Flow diagrams and illustrations.

538 Catalytic Combustion of Atmospheric Contaminants in Effluent From Wire Enameling Ovens. Alexander E. Goss. *Wire and Wire Products*, v. 26, Nov. 1951, p. 1051-1055, 1089-1090.

Investigation of the above indicates that considerable reduction of atmospheric contaminants and combustible materials from the above is possible.

Books

539 Water Supply and Treatment. Charles P. Hoover. 211 pages. 1951. National Lime Association, Washington, D. C. (TD345 H76w7)

Discusses water supplies and methods by which water is treated for human and industrial requirements. Numerous diagrams and illustrations show equipment and procedures.

540 Industrial Wastes; Their Conservation and Utilization. Ed. 1. Charles H. Lipsett. 317 pages. 1951. Atlas Publishing Co., New York. (TP995 L66)

Purpose of the book is to give the average reader an acquaintanceship with the principal scrap and waste materials, their sources of supply, their production and processing. The various types of wastes are discussed in turn. Includes several sections on metallic wastes.

541 Water Quality and Treatment. Ed. 2. 451 pages. 1950. American Water Works Assn., New York. (TD430 Am35w2)

Covers all phases of engineering, management, water supply and treatment. Emphasizes improving physical, chemical, and bacteriological quality. Includes illustrations of bacteria and protozoa; and detailed table on chemicals used. Chapters on iodization, fluoridation and their effects.

19. FUEL TECHNOLOGY

542* Inflammability Limits of Ethane, Propane, and Butane; Evidence for a Double Inflammation Mechanism. (In French.) Ralph Delbourgo and Paul Laffitte. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 958-961.

The above were investigated, using as method of ignition a condensed spark produced by discharge of 22,000 volts between 2 Pt electrodes in a tube 4 cm. in diam. and 80 cm. long. Data are charted and discussed.

543* Variation With Pressure of the Fundamental Rate of Flame Propagation in Gaseous Mixtures and Colloidal Powders. (In French.) Numa Manson. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1085-1087.

Summarizes recent observations on above and compares them to results of calculations of 5 gaseous combustible mixtures and 3 colloidal powders.

544 The Vapour-Phase Oxidation of Methylcyclopentane. J. H. Burgoyne and J. A. Silk. *Journal of the Chemical Society*, Feb. 1951, p. 572-584.

Pressure-temperature limits for spontaneous cool- and hot-flame ignitions of an equimolecular methylcyclopentane-oxygen mixture in a 550-cc. quartz bulb were determined; and effect of fuel-oxygen ratio was briefly studied. Progressive changes in concentration of products or product groups in high- and low-temperature slow combustion and cool-flame reactions in the same vessel were also investigated. Similarly, the products formed in a Pyrex-glass flow system at atmospheric pressure were studied for different fuel-oxygen ratios and for an equimolecular mixture at varying residence times, all the reacting media being diluted with an equal volume of nitrogen.

545* Some Industrial Uses of Radio Isotopes. Part I and II. J. L. Putman. *Coal and Gas*, v. 13, Oct. 1951, p. 365-369; Nov. 1951, p. 405-407.

Describes uses of radioactive tracers in industrial research and gives examples in the carbonizing industries. 14 ref.

546 Burning Coals From the Northern Great Plains Province. John H. Cruise and Otto DeLorenzi. *Combustion*, v. 23, Nov. 1951, p. 43-48.

Reviews experiences in burning the above fuels, particularly lignite, on underfeed, traveling-grate, and spreader stokers, as well as in pulverized form. Discusses furnace designs best adapted to such use. Diagrams and graphs.

547* Britain's Fuel Problems and the Work of the Fuel Research Station. A. Parker. *Engineer*, v. 172, Oct. 12, 1951, p. 476-477; Oct. 19, 1951, p. 505-508. (A condensation)

Surveys the above.

548 Burning Velocity Determination. Part VII. The Burning Velocities of Some Ethylene+Oxygen+Nitrogen Mixtures. H. S. Pickering and J. W. Linnett. *Transactions of the Faraday Society*, v. 47, Oct. 1951, p. 1101-1106.

The effects of pressure on the above were examined by the soap bubble method. Burning velocities, at atmospheric pressure, of $C_2H_4+O_2+N_2$ mixtures containing 9% C_2H_4 and 19-21% O_2 were determined. Data are tabulated.

549 A Method for the Measurement of the Temperature Distribution in the Inner Cone of a Bunsen Flame. G. Dixon-Lewis and M. J. G. Wilson. *Transactions of the Faraday Society*, v. 47, Oct. 1951, p. 1106-1114.

Describes the above. Results enable calculation of the approximate orders of magnitude of the rates of heat release in the reaction zone and thus facilitate understanding of the flame process. 11 ref.

550* Colloidal Structure of Coal and Mechanism of Coke Formation. A. Lahiri. *Fuel*, v. 30, Nov. 1951, p. 241-247.

The colloidal structure of coal is likened to the α, β, γ phases (Houwink) of a mixed isogel of the non-hardening type, having a fairly definite gel-point temperature. The relation between dispersed and dispersing phases are governed by surface active forces. Effect of solvents on coal can thus be explained. The mechanism of coke formation is believed to be one of coagulation of the surface-active micelles in the dispersed state due to loss of and change in the nature of the dispersing medium during heating, followed by development and strengthening of the primary bonds at the expense of secondary bonding forces. 38 ref.

551* Physicochemical Aspects of the Pyrolysis of Coal and Related Organic Compounds. D. W. Van Krevelen, C. Van Heerden, and F. J. Huntjens. *Fuel*, v. 30, Nov. 1951, p. 253-259.

In order to obtain further information about the kinetics of pyrolysis, the theory of reaction velocity was elaborated for the condition of regularly increasing temperature. Application of the theoretical results to the experiments performed furnishes proof that the pyrolysis of coal and related organic compounds can be chiefly described by a first-order reaction. Comparison with the pyrolysis of certain model substances may give an idea about the character of the chemical bonds that are broken during the decomposition.

552* Determination of Ash Fusion Temperature Using a Tube Furnace Heated by Silicon Carbide Elements. B. Lees and D. Finch. *Fuel*, v. 30, Nov. 1951, p. 259-262.

Describes and diagrams above furnace and procedure. Performance is compared with results obtained with 2 types of gas-fired furnaces.

553* Carbon Formation in Benzene-Oxygen Diffusion Flames. N. Thorp, R. Long, and F. H. Garner. *Fuel*, v. 30, Nov. 1951, p. 266.

Discusses recent literature on the above.

554* Available Iron in Part-Spent Oxide. P. F. F. Clephane. *Gas Journal*, v. 268, Nov. 14, 1951, p. 421-422, 427, 429.

Deals with the proportion of available Fe present in partly used charges. A method for determining the available Fe is described.

555* The Production of High Temperature in Industry by Town Gas. R. F. Hayman. *Gas World*, v. 134, Dec. 1, 1951, p. 495-504.

Presents results of a study of the above. Problems associated with furnace design and the use of modern refractory materials are discussed. Studies of flow patterns have shown that attention to the design of combustion chambers could do much to improve the performance of combustion chambers and improve the performance of existing plants.

556* The Measurement of Coal Travel in Continuous Vertical Retorts by Means of Radioactive Tallies. C. H. Lewis. *Gas World*, v. 134, Dec. 1, 1951, p. 505-510.

Gives details of a technique that is capable of general application and provides a fairly complete picture of the path and rate of descent of a tally through a working retort.

557* Oil-Firing From a Furnace Builder's Point of View. Alec Garstang. *Journal of the Society of Glass Technology*, v. 35, June 1951, p. 146-157; disc., p. 177-184.

Factors to be considered in the above are commented on and the influence of the different forms of burners and their location in a cross-fired tank furnace on the length of life of the refractories are considered in detail. An oil-fired furnace with individual cell-like regenerators is discussed as a possible future development. Diagrams.

558 Rotational Temperatures of OH in Methane-Air Flames. Herbert P. Broida. *Journal of Chemical Physics*, v. 19, Nov. 1951, p. 1383-1390.

OH rotational temperature refers to the temperature obtained from the distribution of intensity among the various rotational states of an OH band. Investigations of the rotational-energy distribution between 3064 and 3133 A.U. of the hydroxyl radical in absorption and emission in flames at atmospheric pressure of methane premixed with air and oxygen are reported. 14 ref.

559 A Cavity Resonator Method for Electron Concentration in Flames. T. M. Sugden and B. A. Thrush. *Nature*, v. 168, Oct. 20, 1951, p. 703-704.

The above consists of a cylindrical water-cooled copper and brass cavity resonator, tuned by a plunger to oscillate in the mode at about 9,800 megacycles per second. A cylindrical flame passes axially through platinum gauzes, at the base of the cavity and in the tuning plunger. Diagram.

560* More on Simultaneous Firing of Midwest Coal and Natural Gas. L. L. Mowen. *Power Engineering*, v. 55, Nov. 1951, p. 78-79.

Presents some practical data from Iowa Power and Light Co., showing how they have equipped 6 1500-hp. boilers in one plant to burn gas over chain-grate stokers. Initial design was for rear-arch gas firing, but a front-arch installation proved simpler, less costly, better to operate.

561 Crankcase Explosions. G. W. Ferguson. *SAE Journal*, v. 59, Dec. 1951, p. 47-48. (Based on "Diesel Engine Crankcase Explosion Investigation," by G. W. Ferguson.)

A study on the above covered the following phases: crankcase explosion accident reports, analysis of crankcase atmosphere, mechanism of ignition, and possible solutions to the problems.

462* Preliminary Draining of Peat Beds. (In Russian.) D. P. Chernenkov. *Torfianaia Promyshlennost*, v. 28, Mar. 1951, p. 21-22.

Special power shovels used to dig drainage ditches when opening up a new peat deposit are described and illustrated. Drainage system is diagrammed.

563* Spontaneous Combustion of Very Thin Coal Seams. (In Russian.) G. F. Mikheev. *Ugol*, v. 26, Mar. 1951, p. 20-21.

Experience in the coal beds of the Borovich region demonstrates the possibility of spontaneous combustion in beds of 0.3-0.4 m. thickness. Conditions favoring spontaneous combustion are determined.

Books

564 Handbook of Oil Burning. Frank H. Faust and G. Theodore Kaufman, editors. 978 pages. 1951. Oil-Heat Institute of America. (TH7466.06 O5h)

Discusses oil as a fuel; its combustion and preparation; equipment for burning; and application, installation, and maintenance of oil burners.

Miscellaneous Publications

565 The Coal Research Laboratory; A Pilot Plant for Low Temperature Carbonization of Coal. Robert Lewis Kimberly. Engineering Experiment Station, University of Kentucky, Bulletin 21, Sept. 1951, 52 pages. (T21 K14b)

Discusses the low-temperature carbonization of coal as carried on at the University of Kentucky experimental station. 10 ref.

See also:

5 (coke handling and treatment)

20. HEATING, DRYING, AND AIR CONDITIONING

566 Power Plant in the Heavy Clay Industries. John Fox. *Transactions of the British Ceramic Society*, v. 50, Oct. 1951, 385-414.

Reference is made to drying requirements in the industry. The advantages and disadvantages of independent power plants are then discussed and particular reference is made to the utilization of exhaust steam. A section dealing with the relative merits of different types of prime-movers is followed by a review of modern boiler-house practice, as applicable to the industry. The 4 principal methods of mechanical stoking are discussed and some notes on boiler feed-water treatment are included.

567 Use Glass as Heat Source in Metal Processing. *Ceramic Industry*, v. 57, Dec. 1951, p. 83-84.

Discusses the principles of using molten glass, melted and kept molten electrically, as a source of heat for furnaces where high temperatures are required. Method is said to be practical for annealing strip, heating ingots and cold billets, if power cost is low.

568* Special Pulverized Fuel Plant. *Edgar Allen News*, v. 30, Nov. 1951, p. 997-1000.

Describes a British "Rema" Pulverized Fuel Plant that supplies the fuel requirements of a number of furnaces used in the manufacture of aluminous cement.

569 Ignition Delay in Oil Burners. Ferdinand Hamburger, Jr. *Electrical Engineering*, v. 70, Dec. 1951, p. 1069. (A Condensation.) (To be published in *AIEE Transactions*, v. 70, 1951.)

The delay referred to is the time interval occurring between application of voltage to the ignition transformer primary and the initiation of the spark discharge in the spark gap. A laboratory investigation of this delay phenomenon was carried out and results graphed.

570* What Are the Cost Factors in Electric vs. Gas Furnace Operations? A. D. Spillman. *Electrical World*, v. 136, Nov. 19, 1951, p. 108-111.

Discusses the above as applied to various metallurgical and nonmetallurgical operations.

571* The Optimum Tube Lay-Out for Heat Exchangers. E. Eckert. *Engineers' Digest*, v. 12, Nov. 1951, p. 358-362. (Translated from *Forschung auf dem Gebiete des Ingenieurwesens*, v. 16, no 5, p. 133-140.)

An investigation was made to determine which arrangement of tubes results in the smallest heating surface with a given pressure loss and, conversely, which arrangement results in the smallest pressure loss with a given heating surface.

572* Further Aspects of Space Heating. VI. Heat Input Computation for Non-Aerated Jets. William J. Gilchrist Davey. *Gas World*, v. 134, Nov. 17, 1951, p. 452-453.

Considers further, the question of Wobbe Indices and shows how heat imputs can be calculated for Bray industrial and miniature jets, from the Wobbe Index of a particular gas.

573 What Are Present Limits to Electric Furnace Size? J. L. Bray. *Iron Age*, v. 168, Dec. 13, 1951, p. 127-130.

Surveys the above. Barring unforeseen electrical developments, arc furnaces will probably be built in sizes smaller than 150-ton units. Furnaces will be better but physical and electrical factors will limit size. When current transmitted is greatly increased, losses become disproportionately great.

574* Formulas and Tables for Calculation of Impedance of Bus Bars for Electric Furnaces. (In French.) F. V. Andreae. *Journal du Four Électrique et des Industries Électrochimiques*, v. 60, Mar.-Apr. 1951, p. 40-42; May-June 1951, p. 73-75; July-Aug. 1951, p. 99-102; Sept.-Oct. 1951, p. 126-129.

Above are tabulated.

575* Fuel Economy. III. Heating and Ventilation in Relation to Human Needs. T. Bedford. *Research*, v. 4, Nov. 1951, p. 497-502.

Discusses various factors in the above. 11 ref.

576* Evaluation and Development of Kiln Efficiencies. Part VIII. Losses in Heat Utilization Due to CO_2 From Stone and H_2O in Fuel. Victor J. Azbe. *Rock Products*, v. 54, Nov. 1951, p. 85-87, 109.

Considers the above in some detail. Temperature differential and zonal overlap are stressed. Data are graphed and tabulated.

See also:
546 (furnace designs for lignite combustion)
564 ("Handbook of Oil Burning"—Book)
1022 (infrared lamps in industrial heating)

21. PRIME MOVERS

577* Principles of Missile Guidance Systems. *Aero Digest*, v. 63, Nov. 1951, p. 88, 90, 92, 94, 96, 98-103.

Outlines principles, problems, and detailed developments in above field.

578* The Flow of an Incompressible Fluid Through an Axial Turbo-Machine With Any Number of Rows. J. W. Railly. *Aeronautical Quarterly*, v. 3, Sept. 1951, p. 133-144.

A method is described whereby, at any point in an infinite parallel annulus, the approximate axial velocity due to a single row of high-aspect-ratio blades may be calculated from a knowledge of the conditions of flow adjacent to the blades.

579* Orbital Space Vehicles for Interplanetary Flight. *Aircraft Engineering*, v. 23, Nov. 1951, p. 334-336.

Summaries of some of the papers read at the Second International Congress on Astronautics held in London by the British Interplanetary Society on Sept. 3-8, 1951.

580 Aspects of Combustion Stability in Liquid Propellant Rocket Motors. Part I. Fundamentals. Low Frequency Instability With Monopropellants. L. Crocco. *Journal of the American Rocket Society*, v. 21, Nov. 1951, p. 163-178.

(To be continued.)

581 Chemical Kinetics and Rocket Nozzle Design. F. J. Krieger. *Journal of the American Rocket Society*, v. 12, Nov. 1951, p. 179-185.

Effect of chemical kinetics on rocket-nozzle design was investigated for the particular case of hydrogen gas flowing adiabatically through a typical rocket nozzle having a chamber-to-throat-area ratio of 2 to 1. The following types of flow were considered: constant composition (frozen equilibrium); instantantaneous chemical equilibrium (shifting equilibrium); and kinetic chemical equilibrium. Results are charted and discussed.

582 British Research—Quality, No Quantity. David A. Anderton. *Aviation Week*, v. 55, Nov. 19, 1951, p. 23-24, 27-28.

Refers exclusively to aeronautical research. According to the author there's not much of it in Britain, but what there is is good; and it's well prepared for tomorrow's weapons.

583* 1000KW Marine Gas Turbine Set. *Engineer*, v. 192, Nov. 16, 1951, p. 612-614; Nov. 23, 1951, p. 652-655.

Describes, diagrams, and illustrates the above. Includes performance data.

584* Recuperative Heat Exchanger for Gas Turbines. *Engineering*, v. 172, Oct. 12, 1951, p. 449-451.

Describes, diagrams, and illustrates the above, developed by a British firm.

585* Twenty Years of Oil-Engine Development. C. B. Dicksee. *Engineering*, v. 172, Oct. 19, 1951, p. 490-491; Oct. 26, 1951, p. 541-543. (A condensation.)

Surveys the above.

586* Gas Turbines for Electricity and Process-Heat Production. W. E. P. Johnson. *Engineering*, v. 172, Nov. 9, 1951, p. 601-602. (Condensed from "The Applicability and Present State of Gas Turbine Technology.")

Presents various schemes of combining steam and gas turbines with possibilities for utilizing waste heat. Schematic diagrams are given.

587* Cams and Followers for High-Speed Internal Combustion Engines. E. Fuhrmann. *Engineers' Digest*, v. 12, Oct.

1951, p. 340-342, 348; Nov. 1951, p. 368-370. (Translated from *Maschinenbau und Warmewirtschaft*, v. 6, Aug. 1951, p. 126-134.)

Deals with floating cams of the symmetrical sine type acting on centrally driven flat or round followers. The influence of the factors affecting the valve acceleration curve, the spring forces, the cam shape, and pressure were studied. Also, the sine-type cam and the cam constructed from circular arcs, as well as flat-footed and round followers, were compared. 16 ref.

588* Hydraulic Couplings. R .A. Moller. *Industry and Power*, v. 61, Dec. 1951, p. 102-103.

Describes how cushioning effect of the hydraulic coupling protects driving and driven units. Shock loads from either side are smooth and cannot be transmitted. Heavy loads can start easily and accelerate rapidly after prime mover attains partial speed.

589* Recent Developments in Test Methods for the Knock Rating of Aviation Gasoline. John Ogle. *Journal of the Institute of Petroleum*, v. 37, Aug. 1951, p. 431-442.

Reviews briefly developments which have taken place during the last 10 yrs. in the engine testing of fuels.

590* Burning Bunker Oils in Diesels. E. B. Rawlins, E. D. Newell, and D. C. MacMillan. *Marine Engineering and Shipping Review*, v. 56, Dec. 1951, p. 49-55.

Discusses the above. Characteristics of the fuel are presented. A summary of operating costs is given. Diagrams.

591 Jet Fuel Quality Requirements. What Must the Refiner Know to Make Them? D. P. Barnard. *Petroleum Processing*, v. 6, Nov. 1951, p. 1229-1232.

Discusses the above.

592* Measuring Rapidly Fluctuating Gas Temperatures. B. H. Schultz. *Philips Technical Review*, v. 13, Oct. 1951, p. 104-108.

Describes a method for the above phenomena in thermal engines. Illustrations and diagrams are given.

593* Turbine Pump in Demand for Its Unique Features. P. M. Roth. *Power*, v. 95, Dec. 1951, p. 128-129.

Describes the above which are of simple design with good characteristics. Discusses use in small-capacity units with heads to 600 ft. and in boiler feeding, heating, refrigeration, air conditioning, and many other important power and industrial jobs. Diagrams.

594* Power Plants for High-Speed Aircraft. A. D. Baxter. *Journal of the Royal Aeronautical Society*, v. 55, Oct. 1951, p. 642-650.

Discusses requirements of the above. Characteristics of reciprocating engines, gas turbines, ram jets and rockets are described. Graphs and diagrams.

595 Higher Oil Temperatures in Aircraft Piston Engines. D. N. Harris, T. Frame-Thomson, and D. C. McMacken. *SAE Journal*, v. 59, Dec. 1951, p. 28-35. (Excerpts from "Flight Research Experience With Higher Engine Oil Temperatures," by D. N. Harris, T. Frame-Thomson, and D. C. McMacken.)

Discusses practicability of above. A comparison is given of XB-26F with R-2800-83 engine and the B-25J with R-2600-29 engine. Illustrations and tables.

596 Stratocruisers First Commercial Craft to Use Turbosuperchargers. *SAE Journal*, v. 59, Dec. 1951, p. 38-41. (Excerpts from "First Use of Turbosuperchargers in Commercial Aviation" by A. W. White, E. D. Hendrickson, and F. W. Fernald.)

Discusses benefits derived in the above. How the Turbosupercharger works is described with diagrams.

597* Ignition Systems for Future High Compression Engines. *SAE Journal*, v. 59, Nov. 1951, p. 45-48, 59. (Excerpts from "Ignition Systems for Automobile Engines" by H. L. Hartzell.)

Discusses and diagrams various features of the above.

598 4000Rpm Is Practical Aim for Automotive Diesels. *SAE Journal*, v. 59, Dec. 1951, p. 49-56; disc., p. 56-57. (Excerpts from "The Experimental High Speed Cummins Diesel Engine, 4000Rpm—345 Hp—401 Cu In, by N. M. Reiners and R. C. Schmidt.)

Tells how transforming a Cummins diesel designed for trucks into a racing car engine proved that a high-speed automotive diesel is practical. Describes solutions to various engineering problems involved. Performance data are given.

Miscellaneous Publications

599 National Annual Diesel-Fuel Survey, 1951. O. C. Blade. U.S. Bureau of Mines, Report of Investigations, 4830, Oct. 1951, 12 pages. (TN21 Un3r)

Presents a summary of 1951 data on 303 samples of diesel fuel and compares it with a similar summary for 1950.

Books

600 The Performance of Civil Aircraft. F. B. Baker. 302 pages. 1950. Sir Isaac Pitman & Sons, Ltd., London. (TL570 B17p)

Technical information for that portion of the general public interested in aircraft. Covers problems and practical performance characteristics of civil aircraft. Discusses elementary principles, take-off, climbing, aircraft, range calculations, and flight planning for commercial aircraft powered with piston engines. Also summarizes the main cruising characteristics of aircraft having gas-turbine engines, and predicts developments in high-altitude flying.

601 200 Miles Up. J. Gordon Vaeth. 207 pages. 1951. Ronald Press Co., New York. (QC879 V15t Cop. 2)

Presents a summary of recent high-altitude research. Gives information on rocket propulsion, aerodynamics, aircraft design, and aerial photography. Includes numerous photographs.

See also:

353 (uses of strain gages in engines)
470 (bearing-test machine)
525 (bearing metals for engines)
630 (aircraft turbosupercharger bearings)
637 (bearing problems in aircraft gas turbines)
643 (lubricants for gas turbines)
659 (vibration failure in gas-turbine buckets)
1053 (railroads of the world—book)

22. CERAMICS

602 The Control of Beryllium Oxide in the Ceramic Industry. A. J. Breslin. *American Ceramic Society Bulletin*, v. 30, Nov. 1951, p. 395-398.

Essential elements of an adequate health program are reviewed.

603 Chemical Durability of Glass: An Outline. Alexander Silverman. *American Ceramic Society Bulletin*, v. 30, Nov. 1951, p. 399-400.

A variety of durability problems with which the glass industry is confronted are listed. After briefly reviewing ancient glass and lessons to be derived from it, possible changes of durability with chemical composition are considered. Special requirements for high temperatures, special radiations, vapor contents, various surface treatments, and other physical treatments are indicated.

604 Adaptability of Porcelain Enamel Application Control Techniques to Glaze Application Problems. G. H. Spencer-Strong and J. E. Marquit. *American Ceramic Society Bulletin*, v. 30, Nov. 1951, p. 401-405.

Methods used in the control of enamel application, including slip characteristics, equipment, application weight and uniformity, and reduction and reclamation of overspray, are discussed. 21 ref.

605* Effect of Temperature and Surface Area of the Cement on Air Entrainment. E. W. Scripture, Jr., S. W. Benedict, and F. J. Litwinowicz. *Journal of the American Concrete Institute*, v. 23, Nov. 1951; *ACI Proceedings*, v. 48, 1951, p. 205-210.

A number of factors influencing air entrainment have been previously reported. Two further factors affecting the amount of air entrained in concrete mixtures (temperature and surface area of the cement) were investigated. The amount of air entrained

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decreases with increasing temperature, expressed as its volume at standard temperature and pressure. With increasing surface area of the cement, the amount of air entrained by air-entraining agents decreases but there is no significant variation when no air-entraining agent is used.

606 Arches of High Rise Designed for Stability. J. D. Keller and J. Spotts McDowell. *Blast Furnace and Steel Plant*, v. 39, Nov. 1951, p. 1358-1370, 1399.

Presents extensive details for design of the above for refractory roofs of industrial furnaces. Includes graphs and tabular data on termal properties of various types of refractory brick.

607* Basic Refractories. C. S. Hedley. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 78-83; disc., p. 83-85.

Tabulates composition and properties of a number of basic refractory materials and considers the principal types with reference to foundry cupolas and ladles. Concludes that, at present, stabilized dolomite brick is the most suitable material for basic cupola linings. A finely ground stabilized dolomite cement is used for patching.

608 The Behaviour of Firebricks on Reheating. Part II. After-Contraction and After-Expansion Under Reducing Conditions. Part III. Some Possible Modifications in the Reheat Test. F. H. Clews, J. F. Clements, and A. T. Green. **Part IV. Variability of Reheat Behaviour in Firebricks. Part V. Some Observations on the Causes of After-Expansion in Firebricks.** J. F. Clements and G. R. Rigby. *Transactions of the British Ceramic Society*, v. 50, Oct. 1951, p. 415-459.

A comprehensive survey on the above. Numerous references.

609 The Mechanism of Solids Drying. *Chemical Age*, v. 65, Nov. 17, 1951, p. 661-662. (Based on paper by D. M. Newitt and M. Coleman.)

Discusses absorption phenomena in drying clays.

610 Scumming of Enamels. *Foundry Trade Journal*, v. 91, Nov. 1, 1951, p. 503-504, 506.

A subcommittee of the Institute of Vitreous Enamellers reports on the above.

611 An Application of Determinant and Matrix Theory to the Calculation of Glass Batches. R. B. Grekila. *Glass Industry*, v. 32, Nov. 1951, p. 553-555, 576.

Sample problems are worked out for flint and amber glass in both matrices and determinants. A rough method of figuring fining agents in the calculated batch is also included. Determinants are applied to finding the necessary proportions of raw materials for a desired analysis. Matrix theory is applied to calculation of final glass analysis from raw materials, as well as calculating the proportions of raw materials from the glass analysis.

612* Recent Research on Dinas Brick. (In Czech.) Rudolf Barta. *Hutnické Listy*, v. 6, Sept. 1951, p. 417-424.

Reviews the above. Describes new raw material known as lyddite developed by the Glass and Ceramics Dept. of the Technical University at Prague. Mechanical proporties are superior. Chemistry of transformations is discussed. Role of SiO is also being studied. 44 ref.

613 The Hydrothermal Chemistry of Silicates. R. M. Barrer and E. A. D. White. *Journal of the Chemical Society*, May 1951, p. 1267-1278.

The formation of crystalline lithium aluminosilicates, and to a lesser extent of silicates and aluminates, was studied by hydrothermal methods over the range 150-450°C.

614 Experiences With Chromite Hearths in Electric Furnaces. Alexander L. Field. *Journal of Metals*, v. 3, Dec. 1951, p. 1123-1125.

Reviews work on the above from 1912 to date.

615 Silicon Carbide Refractories Used as Alternates for Special Service Alloys. John L. Everhart. *Materials & Methods*, v. 34, Nov. 1951, p. 71-75.

A combination of good elevated temperature properties, and high abrasion and corrosion resistance fits above materials for numerous applications where strategic alloys were formerly used. Illustrated.

616 Durable Enamel Finishes on Zinc-Base Die-Castings. E. E. Halls. *Metallurgia*, v. 44, Oct. 1951, p. 174-178.

Discusses the properties of enameled finishes, paying particular attention to the pre-treatment necessary.

617 Ceramic Coatings for Metal Protection at High Temperatures. *Product Engineering*, v. 22, Nov. 1951, p. 177-179.

Tells how life of components made from austenitic stainless steels, Inconel, and other high-temperature alloys can be extended as much as 100% by use of sprayed or dipped ceramic coatings. The South Wind Div. of Stewart Warner Corporation anticipates wide use in production operations.

618* New Method for Measuring the Viscosity of Glass in the Transformation Zone. (In French.) P. Gerard and L. Troussart. *Revue Universelle des Mines, de la Metallurgie des Travaux publics, des Sciences et des Arts appliques a l'Industrie*, ser. 9, v. 94, Nov. 1951, p. 393-396.

Describes the use of the Chevenard differential dilatometer for the above. Data are tabulated.

619* Obtaining the Principal Constituents of Portland Cement in the Pure State. (In French.) G. Batta and R. Plenger. *Revue Universelle des Mines, de la Métallurgie des Travaux Publics, des Sciences et des Arts appliques a l'Industrie*, ser. 9, v. 94, Nov. 1951, p. 410-412.

Describes a simple and original process for obtaining silicate and tricalcium aluminate in the pure state by using gypsum as a raw material.

620* Porosimeter Method for Measuring Degree of Clinker Burning. T. Yoshii and Y. Murakami. *Rock Products*, v. 54, Nov. 1951, p. 88-89, 92.

Describes an apparatus used in the above. The method is compared with other methods of porosity measurements. Data are tabulated and graphed.

621 A Student's Approach to the Theory and Practice of Vitreous Enamelling. (Continued.) J. H. Gray. *Sheet Metal Industries*, v. 28, Nov. 1951, p. 1043-1050.

Treats the following topics: sheet-iron cover coating, brushing and transferring, production of castings for vitreous enameling, preparation of surfaces for enameling, and processing of castings after shot-blasting. Tables and illustrations.

622* The Electrical Properties of Some Lithia-Containing Glasses. A. E. Dale, E. F. Pegg, and J. E. Stanworth. *Journal of the Society of Glass Technology*, v. 35, June 1951, p. 136-145.

Measurements of thermal expansion, d.c. electrical resistivity, dielectric constant, and loss angle were made on various Li-containing glasses. Graphs, tables, and diagrams.

623* Oil-Firing: The Viewpoint of the Glass Manufacturer. S. Kruszewski and E. Seddon. *Journal of the Society of Glass Technology*, v. 35, June 1951, p. 158-176; disc., p. 177-184.

The thermal efficiencies of oil-fired and of gas-fired glass-tank furnaces are compared, the comparison being based on theoretical calculations as well as on heat balances and glass-melting efficiencies. The effect of oil firing on refractories, on the length of furnace life, and on furnace operation is discussed.

624* Sintered Ceramics as Materials for Cutting Tools and Turbine Blades. (In German.) E. Felix Singer. *Sprechsaal für Keramik; Glas; Email*, v. 84, Sept. 20, 1951, p. 362-366; Oct. 5, 1951, p. 394-399; Oct. 20, 1951, p. 415-417.

Shows that the great hardness, heat resistance, and excellent mechanical, electrical, and chemical properties render metal oxides especially suitable for a variety of machine parts, including inserts for cutting tools. Tables, photographs, and diagrams. Concluding article discusses structure of clays suitable for above purpose, improved sinterable clays, and other sinterable masses (oxides and oxide-metal mixtures.)

625* Thermal Expansion of Certain Refractories Used in the Glass Industry. (In Russian.) N. V. Solomin, N. M. Gal-

dina, and N. A. Fridlender. *Steklo i Keramika*, v. 8, Mar. 1951, p. 8-11.

Dilatometer designed by Solomin is described and results of dilatometric investigation of kaolin, clay, Dinas brick, various mullites, corundums, and porcelains are tabulated and charted.

626* Quick Annealing of Brick by the Method of P. A. Duvanov. (In Russian.) B. N. Gak and G. A. Kalantar. *Steklo i Keramika*, v. 8, Mar. 1951, p. 17-22.

Data of investigation of the above in the Voronezhskii factory are presented in graphic and tabular form. It was found that the Duvanov annealing method reduces the annealing time to 2 days or less.

627* The Coloring of Glass. (In French.) J. M. Stevels. *Verres et Réfractaires*, v. 5, Aug. 1951, p. 197-204.

Discusses determination of the above with respect to the relation between position of the "absorption slope" and structure of glass, the colors caused by various specific absorbed ions in the visible spectrum, and the interaction among cations in the glass. Includes graphs, diagrams, and tables. 13 ref.

Miscellaneous Publications

628* Bibliography on Durability of Concrete; Physical Reactions. Highway Research Board, Bibliography 8, 1951, 35 pages.

271 references beginning with 1837 are chronologically arranged and annotated.

See also:
139 (carbide-metal combinations)
196 (metallizing glass)
295 (resistance of ceramics and ceramals to thermal shock)
304 (cermets—properties and applications)
421 (determination of Al in silica brick)
555 (high-temperature refractories)
557 (oil-fired furnace for melting glass)
566 (heating requirements in heavy clay industries)
567 (molten glass as furnace-heating medium)
741 (exchange capacity of silicate minerals)
742 (behavior of heteroionic and homoionic clays)

23. LUBRICATION AND FRICTION

629 The Nonsteady-State Load-Supporting Capacity of Fluid Wedge-Shaped Films. Ernest K. Gatcombe. *Transactions of the American Society of Mechanical Engineers*, v. 73, Nov. 1951, p. 1065-1075.

Presents results of an investigation of the thickness and the corresponding load-supporting capacity of fluid wedge-shaped film entrapped between the peripheral surfaces of circular rotating disks on parallel shafts, which have their center-to-center distance constantly changing, so as to cause the film to become alternately thin, then thick at moderately high frequencies. Diagrams and graphs.

630 Aircraft Turbosupercharger Bearings—Their History, Design, and Application Technique. S. R. Puffer. *Transactions of the American Society of Mechanical Engineers*, v. 73, Nov. 1951, p. 1077-1084.

631 The Rheological Properties of Some Soap-Oil Systems. G. B. Moses and I. E. Puddington. *Canadian Journal of Chemistry*, v. 29, Nov. 1951, p. 996-1009.

Flow properties of dispersions of Na, Li, and Al soaps in hydrocarbon oils were measured over a range of temperature, concentration, and rate of shear using an extrusion plastometer. Variation of thixotropy with concentration is in accord with theoretical predictions, and axial ratios of the solid-phase particles, calculated from viscosity data, are in agreement with observed values.

632 The Nature of the Static and Kinetic Coefficients of Friction. Ernest Rabinowicz. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1373-1379.

Experiments were carried out to determine the transition between static and kinetic conditions when stationary metal surfaces are set into motion, a simple method being used which measures the energy that has to be given to one of the bodies to start it moving. The method is confined to cases in which the static coefficient exceeds the kinetic. 11 ref.

633* Hydrodynamic Lubrication of Rotating Disks in Pure Sliding; A New Type of Oil Film Formation. A. Cameron. *Journal of the Institute of Petroleum*, v. 37, Aug. 1951, p. 471-486.

Reynolds' classical hydrodynamic lubrication theory leads to equations which show that formation of an oil film between disks is dependent on rolling velocity only. Experiments carried out by the author show that it is possible to get an oil film under conditions of pure sliding with no rolling at all. Classical lubrication theory will not explain this new effect. The new theory is tested numerically. 12 ref.

634* Oil Deterioration in Theory and Practice. R. G. Larsen and H. Diamond. *Lubrication Engineering*, v. 7, Dec. 1951, p. 272-276, 281.

Discusses the above including the effects of and ways of preventing oxidation. Examples are given of practical applications of fundamental principles, namely, to internal-combustion engines, steam turbines, hydraulic equipment, torque converters, tempering, heat transfer, and electrical transformers. Data are tabulated and graphed.

635* Proposed List of Mathematical Symbols for Lubrication Problems. John Boyd. *Lubrication Engineering*, v. 7, Dec. 1951, p. 282-283.

Presents and discusses the above.

636* The Precision Measurement of Roundness. *Machinery Lloyd* (Overseas Edition), v. 23, Nov. 10, 1951, p. 97-100.

Describes an apparatus for the above. Application to ball-bearing testing is given.

637 Lubrication—Bearing Problems in Aircraft Gas Turbines. E. M. Phillips. *Mechanical Engineering*, v. 73, Dec. 1951, p. 983-988.

Surveys the above. Requirements for most bearings supporting a high-speed rotor are outlined. Results of tests on ball-bearing failure are given. Data are tabulated.

638* The Hypothesis of Supporting Crystals in Metal Alloys for Bearings. (In German.) V. Schneider. *Metall*, v. 5, Nov. 1951, p. 490-494.

Discusses application of above hypothesis to various bearing metals, in order to explain their frictional characteristics. It was found that other characteristics are more important for determining the suitability of an alloy for bearings. Data are tabulated and charted; micrographs illustrate the article.

639* Cutting Oils. A. E. Williams. *Mining Magazine*, v. 85, Nov. 1951, p. 279-282.

Discusses their properties and uses. Compares results of cutting with and without oil.

640 A Study of Metal Transfer During Sliding, Using Radioactivaiton Analysis. E. Rabinowicz. *Proceedings of the Physical Society*, v. 64, sec. A, Oct. 1, 1951, p. 939-940.

A Cu surface was slid over a steel surface, and as a result some Cu fragments were transferred to the steel. The steel specimen was then activated in a nuclear pile, and within a few hours of its removal from the pile an autoradiograph was made of its surface. Results are analyzed.

641* Power's Handbook on Bearings and Lubrication. J. J. O'Connor. *Power*, v. 95, Dec. 1951, p. 79-109.

Presents an extensive review on the above. Phases covered are: friction, sliding bearings; rolling bearings; testing lubricants, oils, synthetics, additives, greases, solid lubricants; and methods of using and applying lubricants.

642 Noise and Vibration in Ball Bearings. George H. Kendall. *Product Engineering*, v. 22, Dec. 1951, p. 150-155.

Discusses ways of recognizing the symptoms and identifying the causes of the above. Design precautions that can be made are outlined.

643* Petroleum Requirements of British Gas Turbines. Part II. Lubricants. *SAE Journal*, v. 59, Nov. 1951, p. 20-24. (Excerpts from "The Development of the Aircraft Gas Turbine in Great Britain and Its Influence on Petroleum Requirements," by Kenneth C. Hunt.)

Discusses the characteristics of lubricants and their applications to various engines.

24. DESIGN

644* Frictional Resistance of Turning Discs in a Fluid and Integral Equations Applied to This Problem. Dimitri Riabouchinsky. (In French.) *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 899-901.

Presents a comparative study of various experiments on above. Data are charted.

645* A Note on the Stressing of Oleo-Pneumatic Shock Absorbers. D. M. A. Leggett. *Aeronautical Quarterly*, v. 3, Sept. 1951, p. 128-132.

Discusses the stresses set up in the hollow circular cylinders which form part of most oleo-pneumatic shock absorbers.

646* Replacement of Masses and Areas by Equivalent Particles. G. R. Brailsford. *Aircraft Engineering*, v. 23, Nov. 1951, p. 330-333.

A simplified method for engineers for determining such characteristics as moment and product of inertia.

647* Air in Hydraulic Transmission Systems. D. Rendel and G. R. Allen. *Aircraft Engineering*, v. 23, Nov. 1951, p. 337-338.

Describes the effect on the reversibility of a hydraulic mechanism of variations in the bulk modulus of the fluid used.

648 The Fatigue Strength of Threaded Connections. R. C. A. Thurston. *Transactions of the American Society of Mechanical Engineers*, v. 73, Nov. 1951, p. 1085-1092.

Published information on the above subjected to dynamic loading is surveyed and summarized, with particular reference to high-duty applications. In general, the basic principles to be followed in the design of high-strength bolt and stud assemblies are outlined, the reasons underlying them explained, and evidence in their support given when possible. Refers largely to steels. 31 ref.

649 Dynamic Force Reactions in Double-Ported Control Valves. C. F. King and G. F. Brockett. *Transactions of the American Society of Mechanical Engineers*, v. 73, Nov. 1951, p. 1101-1106; disc., p. 1106-1107.

Presents a study of torsional force reactions on V-port inner valves, and vertical force reactions on plug-type inner valves in double-ported control-valve bodies. Discusses ways to reduce these forces. Diagrams.

650 How to Pack Reciprocating Rods Against High Pressures. Walter Cooper. *Chemical Engineering*, v. 58, Nov. 1951, p. 164-166.

Gives design principles required for the severe service conditions found in many high-pressure chemical processes.

651* Solving Beam Problems by Relaxation Methods. R. C.C. Coates. *Engineering*, v. 172, Oct. 12, 1951, p. 456-457.

Details of procedure are clarified by diagrams.

652* The Form of an Aluminum Alloy Angle for Use as a Strut. C. G. Watson. *Engineer*, v. 192, Oct. 19, 1951, p. 482-485.

Describes design of an Al-alloy angle section giving greatest economy of material when used as a strut. The alloy used is Noral 51ST. Its stress-strain relationship is shown graphically. From this is derived a graph in which stress is related to tangential modulus of elasticity; and from this, the Euler curve is constructed.

653* Preliminary Investigation of Hydraulic Lock. D. C. Sweeney. *Engineering*, v. 172, Oct. 26, 1951, p. 513-516; Nov. 9, 1951, p. 580-582.

Describes an investigation carried out in the Mechanical Engineering Department of Birmingham University into the characteristics of the above phenomenon. Influence of hydraulic pressure on the locking force, the build-up of force with time, and the radial movement of the piston in the cylinder were studied.

654* The Form of Tooth Surfaces of Creep-Cut Helical Gears. W. A. Tuplin. *Engineering*, v. 172, Oct. 19, 1951, p. 484-486; Oct. 26, 1951, p. 517-519; Nov. 2, 1951, p. 550-552; Nov. 9, 1951, p. 582.

Discusses various factors in the above. Considers possible means of avoiding the unfavorable low-cut distribution that is characteristic of gears cut on the conventional hobbing machine.

655* The Instability of Thin-Walled Cylinders Subjected to Internal Pressure. J. A. Haringx. *Engineers' Digest*, v. 12, Oct. 1951, p. 329-330. (Translated from *de Ingenieur*, v. 63, July 20, 1951, p. 0.39-0.41.)

Shows that buckling of thin-walled cylinders may occur under certain conditions when cylinders are subjected to internal pressure. A simple formula for calculating the critical pressure is derived, and more complex cases of buckling are also considered.

656* Why, When, Where to Use Mechanical Seals for Centrifugal Process Pumps. D. R. Rankin. *Industry and Power*, v. 61, Dec. 1951, p. 76-78, 117.

Surveys the problems and characteristics of the above. Illustrations and diagrams.

657* Analysis of the Elastic and Plastic Stability of Sandwich Plates by the Method of Split Rigidities. II. P. P. Bijlaard. *Journal of the Aeronautical Sciences*, v. 18, Dec. 1951, p. 790-796, 829.

A mathematical treatment. 16 ref.

658 Reducing Noise in Machines; How to Measure and Analyze Sources to Effect Quiet Operation. D. B. Callaway. *Machine Design*, v. 23, Dec. 1951, p. 122-129.

Considers the more common methods available to the engineer undertaking the above problem.

659 Vibration Failures. E. Colston Shephard. *Machine Design*, v. 23, Dec. 1951, p. 157-160, 208.

Describes how service behavior of gas-turbine buckets is recorded and analyzed for design data. Continuous strain-gage record is radioed from plane in flight to a trailer on the ground. Diagrams show details of strain-gage system.

660 Design Factors for Stress Concentration; Flat Bars With Multiple Notches. A. J. Durelli, R. L. Lake, and E. A. Phillips. *Machine Design*, v. 23, Dec. 1951, p. 165-167.

Stress-concentration values for 1-5 semicircular notches and for a flat-bottom notch with circular fillets are given. Data are graphed.

661* Die Casting Die Design. Part V. (Continued.) H. K. Barton and James L. Erickson. *Magazine of Tooling and Production*, v. 17, Dec. 1951, p. 68, 110, 114, 118, 132.

Deals mainly with the die parts known as "overflows." Includes diagrams.

662 Matching Torque Converters to Prime Movers. W. B. Gibson. *Product Engineering*, v. 22, Nov. 1951, p. 123-129.

Describes 3 basic types, gives terminology, and explains details of necessary calculations. Clarified by graphs.

663 Which Variable Speed Fluid Coupling? R. C. Habicht. *Product Engineering*, v. 22, Dec. 1951, p. 125-128.

Considers the factors that influence the selection of a variable speed coupling for a given application. Illustrations, tables and graphs.

664 Russian Small Arms. *Product Engineering*, v. 22, Nov. 1951, p. 134-139.

Describes and illustrates Soviet-made guns and their components. Their construction is said to indicate that the Russians have not been slow to accept the best in arms design and adapt it to fit their facilities and needs. The Soviet policy of giving attention only to essential items is reflected in nearly every weapon. The guns shown were captured in Korea and sent to Aberdeen Proving Grounds for analysis and evaluation.

665 Glass Fiber Reinforced Plastics. *Product Engineering*, v. 22, Nov. 1951, p. 160-163.

Numerous diagrams and brief text show effect of design procedures on properties and ease of fabrication; recommended direction of loading in relation to laminations; and how to handle reinforcements, attachments, undercuts, and hinged connections.

666 Control of Backlash in Gears by Dimensional Tolerances. M. F. Spotts. *Product Engineering*, v. 22, Dec. 1951, p. 164-167.

Shows how backlash in mating gears is caused by deviations from specified dimensions. A method of solving backlash problems when gears and center distance are individually selected for assembly, is given. Procedure for calculating tooth thickness and center-distance tolerances to obtain required backlash in selective assembly is presented.

667 Friction Wheel Drives Designed for Maximum Torque. Rudolf Kroener. *Product Engineering*, v. 22, Nov. 1951, p. 174-176.

Analyses forces present in friction-wheel drives. Describes development of a design used to protect machines from excessive load torques.

668 Bending Stresses in Eccentric Curved Beams. Joseph P. Vidosic. *Product Engineering*, v. 22, Nov. 1951, p. 180-183.

Presents graphical and analytical data that can be used to accurately calculate stresses in arch and crescent-type eccentric beams.

Miscellaneous Publications

669 Secondary Stresses in Thin-Walled Beams With Closed Cross Sections. Stanley Urner Benscoter. National Advisory Committee for Aeronautics, Technical Note 2529, Oct. 1951, 104 pages. (TL570 Un3t)

An accurate method of determining the above is presented. In Sec. I the equation governing axial displacements is formulated and solved for a beam without longitudinal stiffeners. In Sec. II the corresponding equation is developed and solved for a beam with stiffeners (flanges and stringers). The cross section, loading distribution, and end conditions are assumed to be arbitrary. 19 ref.

670 Contribution to the Calculation of Stresses From Photoelastic Values. D. Vasarhelyi. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 27-34. (TG265 So13p)

A mathematical treatment.

671 Stresses in Rotating Disks Due to Noncentral Holes. K. E. Barnhart, Jr., A. L. Hale, and J. L. Meriam. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 35-52. (TG265 So13p)

In investigation of the above, stress concentration factors for single noncentral holes of various sizes and positions, and for several patterns of noncentral holes concentrically spaced around a central hole, were determined. The validity of an approximate mathematical solution was checked; and the material known as Fosterite was investigated as a suitable medium for dynamic stress analysis. Diagrams.

672 Factors of Stress Concentration for the Bending Case of Fillets in Flat Bars and Shafts With Central Enlarged Section. J. B. Hartmann and M. M. Leven. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 53-62. (TG265 So13p)

The factors of stress concentration for fillets in a field of pure bending were investigated photoelastically for flat bars. Three-dimensional tests using Fosterite and the "stress-freezing" technique were made to obtain correlation between the 2- and 3-dimnsional factors of stress concentration. A novel method of slicing makes possible the obtaining of a series of tests from a single model. Charts and diagrams.

673 Tests and Analysis of Composite Beams With Incomplete Interaction. N. M. Newmark, C. P. Siess, and I. M. Viest. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 75-92. (TG265 So13p)

The effects of an imperfect connection between the two elements of a composite beam are considered. Tests of 6 composite steel and concrete T-beams are described and a theoretical analysis is presented for the general case of beams consisting of two interacting elements. The test results are compared with those given by the theory for incomplete interaction.

Books

674 Industrial Piping. Ed. 1. Charles T. Littleton. 394 pages. 1951. McGraw-Hill, New York. (TP159.P5 L73i)

Practical methods commonly in use for solving such problems as the sizing of pipes and determining pressure drop are presented. No other knowledge is assumed on the part of the user, but a command of algebra and elementary physics. The gas laws are reviewed in the chapter on "Air and Instrument Piping." Flow sheets, diagrams, tables, and graphs.

675 Soil Mechanics, Foundations, and Earth Structures. Gregory P. Tschebotarioff. 655 pages. 1951. McGraw-Hill, New York. (TA710 T78s)

Describes theories of soil mechanics, closely linked to a brief description of the related design and construction practices of soil and foundation engineering. Numerous illustrations, graphs, and diagrams.

See also:

94 (investment castings—design)
128 (carbide die design)
129 (gear design—shot-peening factors)
311 (plastic methods of analysis and design)
318 (design of cast-iron structures)
338a (load and stress evaluation in machine design)
571 (heat-exchanger design)
588 (hydraulic couplings)
642 (design of ball-bearing assemblies)
895 (design for nuclear shielding)
1016 (electronic controls—mechanical design aspects)

25. CHEMICAL TECHNOLOGY

676 Reduction of the Vandium Content of Residual Petroleum Fuels by Solvent Precipitation. W. Sacks. *Canadian Journal of Technology*, v. 29, Nov. 1951, p. 492-495.

Presence of V in petroleum fuels is attributed with effecting ash deposition on and corrosion of alloy steels at high temperatures. Removal of V compounds from residual petroleum fuels of various crudes by asphaltene precipitation was studied. 13 ref.

677 Possible Uses for Refinery Waste; A Survey of a Sulphurous Raw Material. *Chemical Age*, v. 65, Nov. 3, 1951, p. 587-590.

678 Sulphuric Acid From Anhydrite; Process, Cost and Development Reviewed. *Chemical Age*, v. 65, Nov. 10, 1951, p. 621-624. (Condensed from paper by John Manning.)

679 How the New Napalm Process Works. *Chemical Engineering*, v. 58, Nov. 1951, p. 162-163.

Napalm is material that jellies gasoline. It is used in fire bombs and flame throwers. Describes new continuous process that cuts the cost by 59%.

680 Industrial Alcohol. *Chemical and Engineering News*, v. 29, Nov. 19, 1951, p. 4932-4938.

Reports on present economic and technological status and future prospects of the above in the U.S. Graphs and illustrations.

681 Building for the Future in Chemistry. John E. McKeen. *Chemical and Engineering News*, v. 29, Nov. 19, 1951, p. 4939-4941.

President, Chas. Pfizer & Co., discusses, in broad outline, basic steps which should be taken by the chemical industry to translate the findings of science into the greatest good for the most people in the shortest time.

682 Bio-Engineering: Subdivision or New Science. *Chemical and Engineering News*, v. 29, Nov. 26, 1951, p. 5036-5041.

Staff report discusses above new field in which biochemical processes are used in large scale commercial production, thus requiring chemical engineers trained also in biochemistry to design and operate the plants.

683 Performance of Spinning Disk Atomizers. Part I. C. R. Adler and W. R. Marshall, Jr. *Chemical Engineering Progress* (Engineering Section), v. 47, Oct. 1951, p. 515-522.

An investigation was made of the above. Studies were made of the effect of disk speed, feed rate, and air pumping by the disk on power requirements and spray weight distribution. An equation was recommended for estimating power for disk atomizers. A mathematical analysis of the velocity of liquid flow on spinning disks led to a nonlinear ordinary differential equation, which was solved for various conditions on IBM punched card machines. (To be continued.)

25. *Chemical Technology*

684 Improving Filtration and Filtration Rates; Chemical and Mechanical Preparation of Filter Feed Slurries. Charles Fuhrmeister, Jr. *Chemical Engineering Progress* (Engineering Section), v. 47, Nov. 1951, p. 550-554.

Numerous graphs, diagrams, and illustrations.

685 Extractive Distillation; Design and Application. J. M. Chambers. *Chemical Engineering Progress* (Engineering Section), v. 47, Nov. 1951, p. 555-565.

Considers the extractive distillation column that has two sections and where the extractant flows from one extremity to the other, flowing countercurrent to the first key in one section and cocurrent with the second key in the other section. Extensive calculations and graphical interpretation.

686 Elutriation in a Fluidized Bed. G. L. Osberg and D. H. Charles Worth. *Chemical Engineering Progress* (Engineering Section), v. 47, Nov. 1951, p. 566-570.

Narrow cuts of scotchlite bead dust were elutriated from fluidized scotchlite-bead beds in a 3-in. diam. laboratory unit. At low initial dust concentrations, the rate data could be represented by a first-order plot, the slope of which was taken as the elutriation rate constant. This rate constant was empirically correlated with superficial air velocity minus particle terminal velocity, bed- and dust-particle diameters, and depth of bed.

687 Hypersorption Design; Modern Advancements. Clyde Berg. *Chemical Engineering Progress* (Engineering Section), v. 47, Nov. 1951, p. 585-590; disc., p. 590-591.

The Hypersorption process currently is carrying out separations on gas streams from petroleum refining, chemical manufacture, and natural gas operations. Modern advancements in Hypersorption design are outlined which have been incorporated into commercial units with capacities ranging up to 16,000,000 cu. ft./day and abilities to produce as many as 4 well-fractionated products from a single tower. Numerous diagrams.

688* Choice and Development of Catalysts in Industrial Chemistry. H. Hoog. *Chemistry & Industry*, Oct. 20, 1951, p. 872-877.

Analyzes technical requirements for the above. The most important properties being: activity, selectivity, life or simple regenerability and mechanical properties. Special attention is given to the importance of selectivity. In the second part various techniques which can be used for obtaining a catalyst with the desired properties are surveyed. The difference between active substance and catalyst support is discussed and effect of choice of carrier material on activity and selectivity of the final catalyst is demonstrated. Finally, examples of promoters and their action are given. 12 ref.

689 Bargain By-Product. *Chemical Week*, v. 69, Dec. 1, 1951, p. 21-22.

New facilities for recovering uranium highlight technical progress in developing phosphate rock as a source. Recovery from wet-process phosphoric acid is easiest and perhaps of greatest potential significance. However, normal superphosphates, more important tonnagewise, today are getting the lion's share of research attention.

690* Copper Bridges Color Gap. *Chemical Week*, v. 69, Nov. 24, 1951, p. 43-45.

Describes use of Cu compounds in a method for dyeing acrylonitrile synthetic fibers.

691 Derivatives From the Low-Temperature Carbonisation of Coal. Part I. *Industrial Chemist and Chemical Manufacturer*, v. 27, Nov. 1951, p. 497-501.

Reviews processes and plant used at the works of the British Diesel Oil and Petrol Co., Ltd., for production of an extensive range of derivatives from the crude oil obtained by low-temperature distillation of coal. (To be continued.)

692* Petroleum in the Paint, Plastics and Rubber Industries. A. J. Goodfellow. *Institute of Petroleum Review*, v. 5, Oct. 1951, p. 337-344.

Surveys the above. 17 ref.

693* Petroleum Sulfonates in Grease Manufacture; A Review of the Patent Literature. R. K. Rhodes. *Institute Spokesman*, v. 16, Nov. 1951, p. 14-15.

27 references.

694* An Index of Mixing; A Study of the Uniformity of Mixtures of Powdered Materials. John A. Dukes. *International Chemical Engineering & Process Industries*, v. 32, Nov. 1951, p. 521-523.

The principles underlying a novel method of determining the heterogeneity of mixtures of powders are described. The idea was originally developed in the Chemical Research Department of Magnesium Elektron, Ltd., and the results of the initial experimental investigations are outlined. An "Index of Mixing" is proposed, giving a quantitative definition of the closeness of approach to the limit theoretically attainable in ordinary industrial plants.

695* Insulating Oils: The Significance of the Wijs Iodine Value. C. N. Thompson. *Journal of Applied Chemistry*, v. 1, suppl. issue no. 1, 1951, p. S40-S48.

Outlines current views on the molecular composition of the hydrocarbons present in petroleum fractions in the insulating-oil range of molecular weights, with special reference to methods for determining degree of unsaturation. In particular, the Wijs method for determining iodine value is discussed. Effects on iodine value of variations in reagent excess, reaction time, and reagent normality are discussed. Significance of iodine value in relation to other properties of electrical insulating oils is discussed. 15 ref.

696* The Insoluble Matter of Coal Tar. VII. Dilution of Tars. S. J. Green and M. J. F. Olden. *Journal of Applied Chemistry*, v. 1, Oct. 1951, p. 433-443.

Previous application of surface-tension rules to dilution of coal tars is criticized. The relation of maximum insolubles to surface tension of the diluents is examined. Data are tabulated and charted. 13 ref.

697* The Separation of Sulphur Compounds by Means of Mercuric Acetate. S. F. Birch and D. T. McAllan. *Journal of the Institute of Petroleum*, v. 37, Aug. 1951, p. 443-456.

Results of investigation of the above are tabulated and discussed. Chemistry is explained.

698* Studies on Linseed Oil. I. The Unsaturated Fatty Acids of Some New Zealand Linseed Oils. W. G. H. Edwards and A. J .D. Robb. **II. Particle Separation of the Unsaturated Acids of Linseed Oil by Counter-Current Distribution Between Pairs of Immiscible Solvents.** L. S. Davies and W. G. H. Edwards. *Journal of the Science of Food and Agriculture*, v. 2, Oct. 1951, p. 429-433.

The composition of the oils from 3 varieties of New Zealand-grown linseed was determined and compared with that of a sample of Indian linseed oil. Some observations on the separation of the component fatty acids are reported. Data are tabulated.

699* Chemical Reaction Equilibria in Calcium and Magnesium-Base Sulphite Recovery System Roy P. Whitney, Richard M. Elias, and Malcolm N. May. *Paper Mill News*, v. 74, Dec. 8, 1951, p. 60, 62, 64, 66, 105.

Presents the results of calculations regarding chemical compounds formed in the recovery furnace, and the effect of combustion conditions. Suggests a possible explanation for the observed differences in composition of the ash from Ca-base and Mg-base liquor combustion. Phase diagrams.

700 Pilot Plant Design. B. M. Wedner, W. A. Horne, and T. P. Joyce. *Petroleum Engineer*, v. 23, Dec. 1951, p. C11-C14, C16.

Discusses general requirements for control and inspection of bench-scale pilot plants.

701 Correlating Physical and Thermodynamic Properties. Part I. Donald F. Othmer and Roger Gilmont. *Petroleum Refiner*, v. 30, Nov. 1951, p. 111-118.

The methods described for the correlation of physical chemical data used in petroleum technology depend on the comparison of the properties of one substance with those of another substance under the same conditions, both by algebraic methods based on sound thermodynamic equations, and geometric plotting. Graphs and nomographs. 30 ref.

702 Production of High-Octane Gasoline Components. Part III. A. A. Draeger, G. T. Gwin, C. J. G. Leesemann, and M. R. Morrow. *Petroleum Refiner*, v. 30, Nov. 1951, p. 139-141.

Presents the final part of a discussion of the chemical conversions effected in refining processes currently in use for the manufacturer of components of motor and aviation gasolines. Especially treated is the behavior of various hydrocarbon types rather than of individual compounds because of the complex composition of petroleum fractions. Data are tabulated and graphed.

703 Production of Ethylene From Petroleum Sources. Part II. Peter W. Sherwood. *Petroleum Refiner*, v. 30, Nov. 1951, p. 157-160.

Part II covers the application of laboratory isobaric and isothermal data to commercial operating conditions.

704* Research and the Paper Industry in Britain Today. A. H. Nissan and G. F. Underhay. *Research*, v. 4, Nov. 1951, p. 503-508.

Surveys the above. 43 ref.

705* Wax Emulsions Formulation by HLB. R. W. Behrens, and W. C. Griffin. *Soap and Sanitary Chemicals*, v. 27, Nov. 1951, p. 128-129.

Tells how to classify waxes and oils by the HLB (hydrophile-lipophile balance) of the emulsion for given applications. The concept of HLB is designed to reduce the amount of trial and error in choosing emulsifying agents.

706* The Mechanical Behavior of Paper. Part I. Geoffrey Broughton, and N. A. Matlin. *Tappi*, v. 34, Nov. 1951, p. 493-497.

Load-elongation curves were measured at constant rates of elongation, varying from 0.02 to 2 in. per min. using the Instron tensile tester. Results are presented for a number of different papers including handsheets and machine-made papers. The data were studied and some tentative correlations are presented. Tables and graphs.

707 Apparent Mildew-Resistance of Weathered Cotton Duck. Edward Abrams. *Textile Research Journal*, v. 21, Oct. 1951, p. 714-720.

Cotton duck—as received, dewaxed, and Kierboiled—was exposed to the weather for periods of time varying from 2 months to 8 months, in single and in double strips. Breaking strength tests of the exposed fabrics show a steady decrease of strength with time, the kier-boiled fabrics losing the greatest percentage of strength. Effects of 6 days incubation with *Chaetomium globosum* after weathering were also investigated.

Books

708 Chemistry of Wood. Ed. 3. Erik Hägglund. 631 pages. 1951. Academic Press, New York. (TA419 H25ctr.)

A new, revised English edition of "Holzchemie," the first edition of which was published in 1928. Emphasis is laid on the fundamentals of wood chemistry, excluding cellulose derivatives. Reactions involving the processing of pulp are discussed in the light of theoretical considerations.

See also:

515 (precious metals in chemical apparatus)
529 ($CuSO_4$ production from mine water)
591 (refining in jet-fuel production)
788 (acetylene in industrial chemistry)
801 (plastics for chemical plant)
820 (paper sizings, coatings, and adhesives)
821 (resin developed for wet-strength paper)
827 (resin bonding of offset paper)
828 (resin bonding of paper)
872 (wild plants as chemical resources)
894 (solid-liquid suspensions)
1059 (research in American petroleum industry)

26. CHEMISTRY—GENERAL, INORGANIC, AND PHYSICAL

709* Relation Between Heat of Melting and Adsorbability of Organic Liquids on Solid Surfaces. (In French.) Louis Robert. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1103-1104.

Above relation is briefly discussed. Data for several common organic liquids on silica gel and on alumina gel are tabulated.

710* Adsorption and Hydrogenation of Gases on Transition Metals. M. E. Winfield. *Australian Journal of Scientific Research*, ser. A, v. 4, Sept. 1951, p. 385-405.

Several principles are suggested which determine the location, and to some extent the behavior, of gas atoms chemisorbed at the surface of a transition metal. For a daitomic molecule, 3 kinds of chemisorbed product are distinguished—adsorbed molecule, adsorbed atom, and adsorbed ion. Bond energies, together with solid models of surface and adsorbate, are used to arrive at the probable mechanism of the ethylene hydrogenation on nickel, and of the Fischer-Tropsch hydrocarbon synthesis.

711* Activated Alumina. *Canadian Chemical Processing*, v. 35, Oct. 1951, p. 815-816.

One of the intermediate products of the Bayer process for producing calcined Al is a dense form of aluminum trihydrate. This, crushed to a desired size and calcined under carefully controlled temperatures, yields a highly porous and adsorptive activated Al, capable of adsorbing moisture from gases with substantially 100% efficiency.

712 Mass-Transfer Rates on Bubble Plates; Fundamental Factors. Part I. J. A. Gerster, W. E. Bonnet, and Irwin Hess. *Chemical Engineering Progress* (Engineering Section), v. 47, Oct. 1951, p. 523-527.

A quantitative study was made of the effect of the major bubble-plate design and operating variables upon gas-film and liquid-film plate efficiency. Gas and liquid efficiencies were shown to be related to the foam height and foam density on the operating tray, since each of these factors affects interfacial area and time of contact for mass-transfer operations. Correlations for foam height and foam density are presented, permitting prediction of the effect of changes in gas and liquid rate, liquid depth, and length of liquid travel upon plate performance. Data are graphed. (To be continued.)

713 An Empirical Equation for Thermodynamic Properties of Light Hydrocarbons and Their Mixtures; Reduction of Equation to Charts for Prediction of Liquid-Vapor Equilibria. Manson Benedict, George B. Webb, Louis C. Rubin, and Leo Friend. *Chemical Engineering Progress* (Engineering Section), v. 47, Nov. 1951, p. 571-578.

Shows how the complex system of fugacity equations may be reduced empirically to a set of charts of fugacity coefficients and K-values that may be used to compute liquid-vapor equilibria in routine design problems without serious loss in accuracy. The procedure for using these charts is described, and an extensive comparison of most of the reported determinations of liquid-vapor equilibria in mixtures of light hydrocarbons with equilibria predicted by the charts is summarized. (To be continued.)

714 P-V-T Relations of Gases. H. P. Meissner and Ralph Seferian. *Chemical Engineering Progress*, v. 47, Nov. 1951, p. 579-584; disc., p. 584.

Experimental compressibility factors of gases may deviate from those predicted by standard compressibility charts. Magnitudes of these deviations are shown to correlate with the compressibility factor at the critical point for the gas in question. A graphical analysis of these deviations is presented, for correction of compressibility factors read from a standard compressibility chart. 49 ref.

715* An Improved Menzies-Wright Ebulliometer for Molecular Weight Determination. N. H. Ray. *Chemistry & Industry*, Oct. 6, 1951, p. 837.

A new form of above apparatus is described which appears to offer several advantages over previous designs, including sufficient sensitivity for it to be useful in the molecular-weight range 1000-4000.

716 On the Elastic Relaxation in Carbon Disulfide: The Temperature Dependence of the Ultrasonic Absorption Coefficient. Daniele Sette. *Journal of Chemical Physics*, v. 19, Nov. 1951, p. 1342-1344.

Presents results of measurements on the above. Data are tabulated and graphed.

717 Elastic Relaxation and Structure of Liquids. I. Ultrasonic Absorption in Some Halogenated Methylenes, Ethanes,

26. *Chemistry—General, Inorganic, and Physical*

and Ethylenes. Daniele Sette. *Journal of Chemical Physics*, v. 19, Nov. 1951, p. 1337-1341.

718 Atom Polarisation. Part II. Relationships Between Molecular Dimensions and Boiling Points for Branched-Chain Paraffins. Arnold Adsley and Frank R. Goss. *Journal of the Chemical Society*, Jan. 1951, p. 120-126.

Data of various investigators are charted, tabulated, and discussed.

719 Some Physical Properties Associated With "Aromatic" Electrons. Part III. The Pseudo-Metallic Properties of Potassium-Graphite and Graphite-Bromide. F. R. M. McDonnell, R. C. Pink, and A. R. Ubbelohde. *Journal of the Chemical Society*, Jan. 1951, p. 191-197.

Graphite is known to form "lamellar compounds" C_8K and C_8Br by absorption of K and Br, respectively. Physical properties of these compounds were studied to elucidate the nature of the bonding, and its effects on the aromatic π electrons in graphite. The marked diamagnetism associated with the π electrons in graphite is destroyed in both compounds. C_8Br is weakly diamagnetic, and C_8K shows a temperature independent paramagnetism of the same order as for metallic calcium. Both compounds are better conductors of electricity than is graphite. A tentative interpretation of these effects is given in the light of the band theory of the energy levels in graphite. Magnetic and electrical data on a compound of formula C_4F whose structure has not yet been established by other means suggest a general similarity in behavior with graphite.

720 Magnetochemistry of the Heaviest Elements. Part III. The Halides of Ter- and Quadri-Valent Uranium. J. K. Dawson. *Journal of the Chemical Society*, Feb. 1951, p. 429-431.

721 Properties of Ion-Exchange Resins in Relation to Their Structure. Part II. Relative Affinities. D. Reichenberg, K. W. Pepper, and D. J. McCauley. *Journal of the Chemical Society*, Feb. 1951, p. 493-499.

The relative affinity coefficients of Na and H ions for sulfonated polystyrene resins of different degrees of cross-linking were determined at 0.1 M. cation concentration in solution. In general, the results are consistent with Gregory's theory, that ion-exchange resins may be regarded as swelling gels, the swelling pressure due to osmotic activity and hydration of ionic groupings being balanced by a counter-pressure exerted by the cross-linked polymeric network.

722 The Constitution of Copper Peroxide and the Catalytic Decomposition of Hydrogen Peroxide. Abraham Glasner. *Journal of the Chemical Society*, April 1951, p. 904-910.

On the evidence of photometric and gasometric measurements, it is concluded that copper peroxide is formed by the simple addition of an HO_2 radical to cupric hydroxide. The catalytic decomposition of H_2O_2 is shown to be proportional to the concentration of copper peroxide present at any moment in the solution.

723 The Structures of Inorganic Oxy-Acids; The Crystal Structure of Selenic Acid. M. Bailey, and A. F. Wells. *Journal of the Chemical Society*, April 1951, p. 968-973.

724 The Thermal Decomposition of Carbonyl Sulphide. J. R. Partington and H. H. Neville. *Journal of the Chemical Society*, May 1951, p. 1230-1237.

Equilibrium conditions of the two decomposition reactions of COS were further investigated. The reaction leading to CO_2 is shown to be peculiarly susceptible to the vessel wall; and the rate of the reaction was measured under various conditions. A method was devised for measuring the rate of the fast reaction leading to CO, and a number of velocity values were obtained. The disproportionation of CO, considered as a possible side reaction, is shown not to occur in the range of conditions studied.

725 The Distribution of the Lower Fatty Acids Between Water and a Variety of Solvents. Mansel Davies, Percy Jones, D. Patnaik, and E. A. Moelwyn-Hughes. *Journal of the Chemical Society*, May 1951, p. 1249-1252.

Distribution of acetic and propionic acid between water and a variety of relatively immiscible solvents was examined experimentally at various concentrations and temperatures. Results for the 2 acids in the 8 solvents used are consistent with the view that the force of attraction between the constituents of the dimers is principally, if not entirely, electrostatic.

726 The Oxides of Uranium. Part II. The Binary System UO_3-CaO. K. B. Alberman, R. C. Blakey, and J. S. Anderson. *Journal of the Chemical Society*, May 1951, p. 1352-1356.

The phase diagram of the system CaO-UO_3 was investigated in the range 1650-2300°C. The eutectic temperature is 2080± 20°C., and the eutectic composition about 45 mole % of UO_3 and 55 mole % CaO.

727 The Use of Equilibrium Constants to Calculate Thermodynamic Quantities. Part I. Equilibria in the System tert.-Butyl Chloride, Isobutene, Hydrogen Chloride. K. E. Howlett. *Journal of the Chemical Society*, June 1951, p. 1490-1412.

728 Separation of Yttrium and Erbium With the Aid of Ethylene-Diaminetetra-Acetic Acid ("Enta Acid"). J. K. Marsh. *Journal of the Chemical Society*, June 1951, p. 1461-1463.

729 The Oxidation of Sulphurous Acid. Henry Bassett and William G. Parker. *Journal of the Chemical Society*, June 1951, p. 1540-1560.

The above oxidation by ferric and cupric salts, and by molecular oxygen in presence of various dissolved salts was studied with special reference to the proportions of sulfate and dithionate which are formed.

730 The Liquid-Vapour Equilibrium as a Function of Temperature for the System Arsenic Trichloride—Germanium Tetrachloride. F. Sebba. *Journal of the Chemical Society*, Aug. 1951, p. 1975-1977.

The above was investigated. The curve shows no azeotropes, and therefore the two components can be separated by fractional distillation.

731 The Dehydration of Gypsum. Part I. A Study of the Thermal Decomposition of Gypsum by the Adsorption of Oxygen and Nitrogen at −183°. Part II. A Study of the Thermal Dehydration of Gypsum by Means of the Adsorption of Carbon Tetrachloride Vapour at 25°. S. J. Gregg and E. G. J. Willing. *Journal of the Chemical Society*, Sept. 1951, p. 2373-2380.

In Part I, surface area of gypsum dehydrated at a succession of temperatures between 100 and 700°C. was determined by adsorption of N_2 and O_2. In Part II, CCl_4 vapor was measured at 25°C. on samples of gypsum dehydrated at a succession of temperatures in the same range. Data are charted and discussed.

732 Hydrated Calcium Silicates. Part II. Hydrothermal Reactions; Lime: Silica Ratio 1:1. L. Heller and H. F. W. Taylor. *Journal of the Chemical Society*, Sept. 1951, p. 2397-2401.

733* An All-Glass Calorimeter, and the Heat of Combustion of Ethyl Chloride. D. W. H. Casey and S. Fordham. *Journal of the Chemical Society*, Oct. 1951, p. 2513-2516.

An all-glass calorimeter is described, suitable for determination of the heats of combustion of gases containing halogens. Heat of combustion of ethyl chloride vapor was determined.

734* Hysteresis in Transitions in Solids. D. G. Thomas and L. A. K. Staveley. *Journal of the Chemical Society*, Oct. 1951, p. 2572-2579.

Points out that hysteresis seems to be confined to those cases in which part, at least, of the change occurs almost isothermally. The theory of nucleation proposed by Turnbull is applied to such transitions. Difficulties in quantitative application of the theory are considered; but estimates are made of the range in which surface free-energy values would have to fall to account for observed hysteresis effects. The theory is qualitatively used in consideration of factors which affect the width of hysteresis loops and the sharpness with which transitions set in, and also of observed phenomena within the loops.

735 The Inertial Mechanism in the Mechanical Filtration of Aerosols. Eugene A. Ramskill and Wendell L. Anderson. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 416-428.

It was shown that above plays an important role in mechanical

filtration at lower particle radii than previously calculated. The manner in which the inertial effect enters into the filtration mechanism is expressed by equations. Data are graphed.

736 Adsorption of Aromatic Hydrocarbons in Nonaromatic Media on Carbon Black. M. Van der Waarden. *Journal of Colloid Science,* v. 6, Oct. 1951, p. 443-449.

Discusses the above. Results suggest that the aromatic nuclei are absorbed flat on the surface and that the alkyl chains of the adsorbed aromatic compounds remain mobile in the liquid.

737* Tests for the Consistency of Experimental Isobaric Vapour-Liquid Equilibrium Data. E. F. G. Herington. *Journal of the Institute of Petroleum,* v. 37, Aug. 1951, p. 457-470.

The use of above data in the design of precision fractionating equipment is discussed briefly. A test for the consistency of binary data is presented. The method is applied to vapor-liquid equilibrium values for 24 systems recorded in the 3rd edition (1950) of "Chemical Engineers' Handbook," by J. H. Perry. Data on 10 of these systems are shown to be of doubtful consistency. 33 ref.

738* The Significance of Dispersion in Colloidal Systems. J. Pryce-Jones. *Journal of the Oil & Colour Chemists' Association,* v. 34, Nov. 1951, p. 547-553; disc., p. 553-554.

Discusses some of the more important aspects of the above phenomenon.

739 Phase Equilibria in Hydrocarbon-Water Systems IV. Vapor-Liquid Equilibrium Constants in the Methane-Water and Ethane-Water Systems. O. L. Cylberson and J. J. McKetta, Jr., *Journal of Petroleum Technology,* v. 3, Nov. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 192, 1951, p. 297-300.

Data are extensively tabulated and charted.

740 Ultrasonic Studies of Thorium Phosphate Jellies at Different Temperatures. Arvind Mohan Srivastava, S. Prakash, and V. Mehra. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1413-1417.

Using a new ultrasonic-pulse technique at 2.50, 2.25, and 0.625 megacycles per sec., ultrasonic velocities were determined from which elasticities were calculated. Effects of temperature and of frequency on velocities and elastic contents were studied. The thorium phosphate gel resembles some high polymers and other viscoelastic substances in behavior. 10 ref.

741 Base-Exchange Capacity of Silica and Silicate Minerals. A. K. Ganguly. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1417-1428.

Deals with the significance of the exchange capacity of quartz, kaolinite, mica, and montmorillonite in relation to the crystal chemistry of each. Data are tabulated. 17 ref.

742 The Cation-Exchange Behavior of Heteroionic and Homoionic Clays of Silicate Minerals. A. K. Ganguly and S. K. Mukherjee. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1429-1446.

Cation exchange of heteroionic clays was studied with colloidal salts prepared from a bentonite constituted of montmorillonite alone. The exchange property of the heteroionic systems was found to depend on the method of preparation. Data are tabulated. 23 ref.

743 Ultrasonic Investigation of Elastic Constants of Iron Silicate Gels. Arvind Mohan Srivastava. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1446-1455.

Reports results of a detailed investigation of the above. Data are graphed and tabulated.

744 The Relation Between Exchangeable Ions and Water Adsorption on Kaolinite. A. G. Keenan, R. W. Mooney, and L. A. Wood. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1462-1474.

The above was studied on homoionic kaolinites containing a series of monovalent and divalent exchangeable cations in known amounts. By applying the B.E.T. theory to the data and correlating the results with low-temperature measurements of surface area by use of nitrogen, a quantitative measure was obtained of the extent to which the various ions affect the water adsorption. Data are tabulated and graphed. 26 ref.

745 Catalysis by Silver, Basic Catalysis, and Catalysis by Undissociated Molecules of Acetic Acid in the Reduction of Silver Ion by Ferrous Ion. Bal Krishna and Satyeshwar Ghosh. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1503-1511.

The above was studied with special reference to the role of hydrogen ions, basic ions, and undissociated molecules of acetic acid. The effects of variation in the ionic strength of the medium upon the reaction velocity were also studied. 17 ref.

746 Electrophoresis in Nonaqueous Media. Mason Hayek. *Journal of Physical & Colloid Chemistry,* v. 55, Dec. 1951, p. 1527-1533.

A microelectrophoresis cell was constructed and a technique developed for the measurement of mobilities of suspended particles in nonconducting media in the presence or absence of dispersing agents. Variable and nonuniform charges on particles in such systems were observed. 10 ref.

747* The Sorption of Hydrogen and Carbon Monoxide by an Iron-Copper-Magnesia (Fischer-Tropsch) Catalyst. K. A. Kini, N. G. Basak, and A. Lahiri. *Journal of Scientific & Industrial Research,* v. 10B, Oct. 1951, p. 243-245.

Studies on the above at 99-249°C. show that synthesis of hydrocarbons proceeds through chemisorption. An essential condition for the synthesis is that the chemisorption of CO should predominate over that of H_2.

748 Chemical Effects in Liquids Due to α-Particle Irradiation. P. I. Dee and E. W. T. Richards. *Nature,* v. 168, Oct. 27, 1951, p. 736.

Describes an investigation on the above. Results suggest that the bulk of the chemical effects produced by α-particles in liquids can be explained by secondary effects of quantum emission arising from the primary ionization.

749 Thermochemistry for the Petrochemical Industry. Part XVIII. The Chloroethenes. Kenneth A. Kobe and Roland H. Harrison. *Petroleum Refiner,* v. 30, Nov. 1951, p. 151-154.

Presents data on several of the above compounds. Tables and graphs. 24 ref.

750 The Theory of Oriented Overgrowth of Crystals. F. C. Frank and M. Blackman. *Proceedings of the Physical Society,* v. 64, sec. A, Oct. 1, 1951, p. 941-943.

Discusses previous literature on the above. The stability of a monolayer of an alkali halide, on the surface of another alkali halide, was studied and commented on.

751* Radioactivity of the Heavy Elements. A. G. Maddock. *Quarterly Reviews,* v. 5, no. 3, 1951, p. 270-314.

206 references.

752 Two-Phase Equilibrium in Binary and Ternary Systems. V. Carbon Dioxide-Ethylene. VI. Carbon Dioxide-Propylene. G. G. Haselden, D. M. Newitt, and S. M. Shah. **VII. Calculation of Latent Heats and Some Other Similar Properties.** R. F. Strickland-Constable. *Proceedings of the Royal Society,* ser. A, v. 209, Oct. 8, 1951, p. 1-27.

15 references.

753 Application of the Theory of Conformal Solutions to the System Carbon Dioxide-Ethylene. D. Cook and H. C. Longuet-Higgins. *Proceedings of the Royal Society,* ser. A, v. 209, Oct. 8, 1951, p. 28-38.

The theory of "conformal solutions" is used to calculate the liquid-vapor phase diagram of the above in the critical region. The calculated results are given as isothermal pressure–mole fraction plots at temperatures from −30 +10°C. The theoretical curves agree well with those determined experimentally by Haselden, Newit,, and Shah.

754 Diffusion and Flow of Gases and Vapours Through Micropores. III. Surface Diffusion Coefficients and Activation Energies. P. C. Carman and F. A. Raal. *Proceedings of the Royal Society,* ser. A, v. 209, Oct. 8, 1951, p. 38-58.

Presents theoretical analysis and description of experiments on the above. 15 ref.

755 Physical Adsorption of Gases on Porous Solids. I. Comparison of Loose Powders and Porous Plugs. P. C. Car-

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man and F. A. Raal. **Physical Adsorption of Gases on Porous Solids. II. Calculation of Pore-Size Distributions.** P. C. Carman. *Proceedings of the Royal Society*, ser. A, v. 209, Oct. 8, 1951, p. 59-81.

For the first time, comparison was made of adsorption on a given surface both as a free surface and as the internal surface of a porous plug. In this way it was possible to provide direct evidence both for capillary condensation and for blockage of capillaries with adsorbed layers in porous solids. The Kelvin equation was applied to the data of part I. Pore-size distribution curves are derived and compared for plugs of varying porosity. They provided strong evidence of tightly packed aggregates of particles, and of an increasing uniformity of pore size as porosity is decreased. 20 ref.

756 Two-Phase Equilibrium in Binary and Ternary Systems. VIII. The Integral Flash Latent Heat at Constant Pressure of the System Ethylene-Carbon Dioxide. A. J. Barnard, S. P. Luthra, D. M. Newitt, and M. U. Pai. *Proceedings of the Royal Society*, ser. A, v. 209, Oct. 23, 1951, p. 143-157.

A method of determining the above at constant pressure is described. Results are given and compared with those calculated from the Duhem-Margules equation.

757 Adsorption of Water Vapour on Solid Surfaces. F. P. Bowden, and W. R. Throssell. *Proceedings of the Royal Society*, ser. A, v. 209, Nov. 7, 1951, p. 297-308.

Presents results of a study on the above. Two methods are used, the first a direct weighing of the adsorbed film on a microbalance and the second an examination of polarized light reflected from the surface. Studies were made on Au, Pt, Ag, Al, and zinc blende. 26 ref.

758 Ionization by Electron Impact in CO, N_2, NO, and O_2. Homer D. Hagstrum. *Reviews of Modern Physics*, v. 23, July 1951, p. 185-203.

The above was studied with a mass spectrometer designed to measure appearance potential and initial kinetic energy for each ion observed. Discussion is included on the nature and identification of dissociative ionization processes and of retarding potential and appearance potential measurements. Data are tabulated and graphed. 28 ref.

759* The Adiabatic Coefficient of Dissociating Combustion Gases in Adiabatic-Isentropic Expansion. (In German.) Gerhard Klobe. *Zeitschrift für angewandte Mathematik und Physik*, v. 2, Sept. 15, 1951, p. 394-402.

Data are graphed and tabulated.

760* Amorphous Arsenic. (In German.) H. Richter and G. Beitling. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 721-741.

Describes preparation of above and method of determining atomic distribution, atomic numbers, and atomic distances in order to explain structure of amorphous As. Results show different degrees of amorphous state and that all lack normal space-lattice structure. A chain model explains different forms of amorphous As. Photographs, X-ray picture, electron micrographs, diagrams, tables, and graphs. 22 ref.

761* Phenomena in Supersaturated Solid Solutions. (In German.) U. Dehlinger. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 718-721.

It is thermodynamically deduced that the diffusion coefficient in supersaturated solid solutions is negative and thus leads to the formation of complexes. Accompanying potential limits and rising temperature reduce the size of the complexes. Applicability to metallic solid solutions is indicated.

Books

762 Rastvorimost Odnoatomnykh Gazov i Azota. (Solubility of Monoatomic Gases and Nitrogen). B. G. Eremina. 117 pages. 1950. Government Publishing House of the S.S. Zhdanov Order of Lenin University, Leningrad, U.S.S.R. (QD543 E35r)

Presents in detail the author's attempts to systematize known data on the above subject and his experimental work based on such organization. The fundamental properties of gases and liquids are studied. Experimental methods are described and voluminous experimental data are tabulated and charted.

763 Thermodynamics From a Generalized Standpoint. Joseph Louis Finck. 124 pages. 1951. Flatbush Publications, Brooklyn, N. Y. (QC311 F49t)

Presents in a unified form the results of experiments on the above. Extends the study to include the metastable states.

764 Photosynthesis and Related Processes. Vol. II. Pt. 1. Spectroscopy and Fluorescence of Photosynthetic Pigments; Kinetics of Photosynthesis. Eugene I. Rabinowitch. 1208 pages. 1951. Interscience Publishers, Inc., New York. (QK882 R11p.)

Detailed text on the spectroscopy and fluorescence of photosynthetic pigments and analysis of kinetic data. Also covers new work on photochemistry of pigments, and the chemistry of CO_2 reduction by means of radioactive carbon.

765 Structural Inorganic Chemistry. Ed. 2. A. F. Wells. 727 pages. 1950. Clarendon Press, Oxford, England. (QD481 W46s2)

A comprehensive presentation of the above.

766 Statistical Methods for Chemists. W. J. Youden. 126 pages. 1951. John Wiley & Sons, New York. (QA276 Y84s)

Written for those who make measurements and interpret experiments. Characterized by an absence of statistical theory and proofs.

See also:
277 (electrochemistry—fundamentals)
466 (radioactive indicators in biochemistry)
477 (separation of hydrophilic and hydrophobic sols)
688 (development of catalysts in chemistry)
701 (thermodynamic properties of petroleum)
903 (magnetochemistry of plutonium compounds)

27. CHEMISTRY—ORGANIC

767* Aromatic Seleno- and Telluropolythionic Compounds (In English.) Olav Foss. *Acta Chemica Scandinavica*, v. 5, no. 6, 1951, p. 967-968.

Gives a preliminary report on 3 new types of benzene- and p-toluenesulfonyl derivatives: selenium disulfinates, $Se(SO_2R)_2$, and thiosulfonates of divalent Se and Te, $Se(S_2O_2R)_2$ and $Te(S_2O_2R)_2$.

768* Measuring the Number of Free Radicals Produced in Organic Liquids by the Action of γ-Rays. (In French.) Adolphe Chapiro. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 8, 1951, p. 792-794.

Presents results of measurements for 26 different non-ethylenic compounds.

769* The Dielectric Properties of Crystalline Long-Chain n-Primary Alcohols at Low Frequencies. R. J. Meakins and Joan W. Mulley. *Australian Journal of Scientific Research*, ser. A, v. 4, Sept. 1951, p. 365-371.

Describes an extension of an investigation of long-chain secondary alcohols to n-primary alcohols, and discusses the results in terms of the previously suggested theory of dielectric absorption due to the presence of hydrogen-bonded chains of hydroxyl groups. Gives changes in dielectric properties during storage, differences between melted and recrystallized forms, and the effect of dispersing the molecules in an inert solid solvent.

770 Organic Synthesis by Electric Discharge. *Chemical Age*, v. 65, Nov. 3, 1951, p. 591-592. (Based on paper by K. Sugino and E. Inone, *Bulletin of the Chemical Society for Japan*, June 1951.)

Outlines formation of phenol from benzene and air; formation of benzyl alcohol, benzaldehyde, benzoic acid, and cresols from toluene and air; formation of cyclohexanol and cyclohexanone from cyclohexane and air; and formation of aniline and other basic compounds from benzene and ammonia.

771* Identification of Some Higher Alkyl Halides and Dehalogenated Paraffines. (In German.) M. Jurecek and M. Vecera. *Collection of Czechoslovak Chemical Communications*, v. 16, Feb. 1, 1951, p. 95-99.

Brief description of procedure includes tabular data. 11 ref.

772* The Analysis and Composition of Copper Acetylide. W. C. Easterbrook and J. W. Erskine. *Journal of Applied Chemistry*, v. 1, suppl. issue no. 1, 1951, p. S53-S61.

Copper acetylide made by slightly different procedures was of uncertain composition. Semimicro methods were therefore devised for the determination of Cu^{2+} and Cu^{+}, as well as the carbonaceous matter found on decomposition of the acetylide with dilute HCl. The empirical formula ($Cu_1C_1H_2O$) of the copper acetylide was determined by ultimate microanalysis and use was made of this result in calculating the cuprous acetylide content. Essential differences in two acetylides examined were due to variations in conditions of precipitation, time of passage of acetylene, and oxidation of the material. 14 ref.

773 The Mechanism of the Reactions of Aliphatic Hydrocarbons. Louis Schmerling. *Journal of Chemical Education*, v. 28, Nov. 1951, p. 562-571.

48 references.

774 Polarographic Behaviour of Iodo-Compounds. Part I. E. Gergely and T. Iredale. *Journal of the Chemical Society*, Jan. 1951, p. 13-15.

Organic iodo-compounds are reducible at the dropping-mercury cathode, hydrogen replacing the iodine which appears as the iodide ion. The half-wave potentials are independent of pH in the case of most non-ionizable compounds, but reduction of such compounds as acids and amines is pH dependent.

775 Chemical Actions of Ionising Radiations in Solution. Part VII. Radiation Chemistry of Sterols. The Action of X-Rays on Cholic Acid in Aqueous Solution. Max Keller and Joseph Weiss. *Journal of the Chemical Society*, Jan. 1951, p. 25-26.

776 Studies in Co-ordination Chemistry. Part VII. Complexes of Univalent Copper With a (Ditertiary Arsine). A. Kabesh and R. S. Nyholm. *Journal of the Chemical Society*, Jan. 1951, p. 38-43.

777 The Heterolytic Fission of the Carbon-Iodine Bond in Trifluoroiodomethane. J. Banus, H. J. Emeleus, and R. N. Haszeldine. *Journal of the Chemical Society*, Jan. 1951, p. 60-64.

The exchange reaction between iodide and trifluoroiodomethane in alcoholic solution at 20°C. was studied by using radioactive iodine as a tracer.

778 Some (n, γ) Effects in Iodobenzene. P. F. D. Shaw. *Journal of the Chemical Society*, Feb. 1951, p. 443-447.

Some of the factors affecting the reproducibility of extractions (by an aqueous reagent) of radio-iodine from neutron-irradiated iodobenzene were studied. In the presence of iodine, extractions are easily reproducible, but without iodine, extractable radio-iodine compounds are probably produced by "rupture" of benzene rings caused by the energetic recoiling radio-iodine atoms.

779 The Reactions of Metallic Salts of Acids With Halogens. Part I. The Reaction of Metal Trifluoroacetates With Iodine, Bromine, and Chlorine. R. N. Haszeldine. *Journal of the Chemical Society*, Feb. 1951, p. 584-587.

780 The Kinetics of the Reduction of Aromatic Iodo-Compounds by Hydriodic Acid in Solution. V. Gold and Mary Whittaker. *Journal of the Chemical Society*, May 1951, p. 1184-1190.

Replacement of iodine atom by hydrogen through action of HI on some substituted p-iodophenols was studied kinetically in acetic acid-water mixtures. The effect of methyl and chloro groups on the reaction velocity of nitration of aromatic compounds was studied. It is concluded that the reduction is an electrophilic replacement of iodine.

781 Chemical Constitution and Surface-Active Properties. 2-Alkylpyridines and 2-Alky-1 Methylpyridinium Iodides. M. J. Birchenough. *Journal of the Chemical Society*, May 1951, p. 1263-1266.

Hydrochlorides and methiodides of a number of 2-alkylpyridines were examined for their effect on aqueous surface tension and for their antibacterial power. Maximum activity in both respects was exhibited by the salts of 2-pentadecylpyridine.

782 Properties and Reactions of Free Alkyl Radicals in Solution. Part II. Reactions With Iodine, Bromine, and Sulphuryl Chloride. M. C. Ford and William A. Waters. *Journal of the Chemical Society*, July 1951, p. 1851-1855.

783 Syntheses With Isotopic Tracer Elements. Part III. The Preparation of Ethylene Oxide and Ethanol Labelled With Carbon Isotopes. Part IV. The Preparation of Methylamine and Diazomethane Labelled With Carbon Isotopes. J. D. Cox and R. J. Warne. *Journal of the Chemical Society*, July 1951, p. 1893-1897.

784 The Chemistry of Fungi. Part XV. The Degradation of Methyl o-Dimethylcitromycetin. Alexander Robertson, W. B. Whalley, and J. Yates. *Journal of the Chemical Society*, Aug. 1951, p. 2013-2018.

785 The Chemistry of Fungi. Part XVI. Eburicoic Acid. R. M. Gascoigne, J. S. E. Holker, B. J. Ralph, and Alexander Robertson. *Journal of the Chemical Society*, Sept. 1951, p. 2346-2352.

786* Study of Bivalent Organic Copper and Nickel Salts. (In French.) Jean Ploquin. *Bulletin de la Société Chimique de France*, Sept.-Oct. 1951, p. 757-763.

The above was investigated with respect to aromatic acids and the normal saturated aliphatic diacids, also the magnetochemistry of the copper salts of some acetic acids. Data are tabulated and charted.

Books

787 The Biochemistry of the Nucleic Acids. J. N. Davidson. 163 pages. 1950. John Wiley & Sons, New York (QP601 D23b)

Provides an elementary outline of the main features of the nucleic acids and nucleoproteins for the benefit of students of biochemistry. Chapter biblographies.

788 Chemie und Technik der Acetylen-Druck-Reaktionen. (Chemistry and Technology of Acetylene Pressure Reactions.) Walter Reppe. 131 pages. 1951. Verlag Chemie, Weinheim, Germany. (TP767 R29c)

Discusses research on the decomposition of acetylene-gas mixtures, the chemistry of C_2H_2-CO reactions at elevated pressures and their use in various industrial chemical processes. Photographs, diagrams and graphs.

789 Nitrovanie Uglevodorodov i Drugikh Organicheskikj Soedinenii. (Nitration of Hydrocarbons and Other Organic Compounds.) A. V. Topchiev. 252 pages. 1949. Academy of Sciences of the USSR, Moscow and Leningrad. (QD281.N5 T62n)

A basic textbook. Nitration of different aromatic, heterocyclic, saturated, and aliphatic-aromatic compounds, HNO_3, oxides of nitrogen, and different organic and inorganic nitrates is described in detail. Apparatus are illustrated and methods of investigation are outlined.

790 The Pectic Substances. Z. I. Kertesz. 628 pages. 1951. Interscience Publishers, New York. (TP248.P4 K47p)

Detailed discussion of pectins with respect to chemistry, botany, biochemistry, manufacture; and functions and applications of pectic substances and enzymes. 2024 ref.

791 Preparation, Properties, and Technology of Fluorine and Organic Fluoro Compounds. Ed. 1. Charles Slesser and Stuart R. Schram, editors. 868 pages. 1951. McGraw-Hill, New York. (TP245.F6 S28p)

One of a series of volumes prepared as a record of the research of the Manhattan Project & Atomic Energy Commission. Consists of 40 articles by different authors. They are classified as follows: introduction; 5 on generation of fluorine; 6 on handling of fluorine; 11 on partial fluorination of organic compounds by replacement of chlorine; 8 on realization of perfluorocarbons; 2 on preparation and properties of chlorotrifluorethylene polymer; and 7 on miscellaneous investigations.

See also:
697 (separation of S compounds by Hg acetate)
764 (chemistry of photosynthesis)

28. PLASTICS AND HIGH POLYMERS

792* The Effect of Transverse Ultrasonic Waves in High Polymer Solutions. (In French.) Roger Cerf. *Comptes Rendus hebdomaduires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1099-1101.

Presents results of a theoretical study of the above, discussing

28. *Plastics and High Polymers*

a torsion crystal method which makes it possible to measure the viscosity of a liquid in periodic laminar flow at ultrasonic frequencies.

793* Cure of Urea-Formaldehyde Resins With Alkaline Catalysts. D. D. Gagliardi. *American Dyestuff Reporter*, v. 40, Nov. 26, 1951, p. P769-P773.

The catalysts presently employed in the curing of ureaformaldehyde resins on fabrics are substances that are compatible with an aqueous solution of methylolurea and that develop acidity at the temperature employed in curing. The various types of compounds develop acidity in various ways, which are explained. Then shows, with extensive data, that alkaline substances may be used as catalysts to obtain both durable crease-proofing and stabilization.

794 Some Chemical Aspects of Phenol-Formaldehyde Resins. P. H. Calderbank. *British Plastics*, v. 24, Oct. 1951, p. 356-358.

Surveys the above.

795 Applications of Aminoplastics to Textiles, With Special Reference to Their Effect on Dyeing and Cleaning Practice. A. R. Smith. *British Plastics*, v. 24, Nov. 1951, p. 386-389.

14 references.

796 Chlorinated Polyphenyls and Their Applications in P.V.C. Compositions and in Surface Coatings. *British Plastics*, v. 24, Nov. 1951, p. 390-392.

Surveys properties and applications. Data are tabulated.

797 All-Canadian Operation Transforms Hard Vinyl Resin to Flexible Film. Margaret Duncan. *Canadian Chemical Processing*, v. 35, Nov. 1951, p. 872-874, 876, 884.

Describes processes and operations for developing vinyl plastics from raw materials at Canadian Resins and Chemicals, Ltd.

797a The Role of Alpha-Ketols in the Low-Sugar Redox Recipe for Low-Temperature Emulsion Copolymerization. R. J. Orr and H. Leverne Williams. *Canadian Journal of Chemistry*, v. 29, Nov. 1951, p. 949-958.

Reviews the literature and presents results of new experimental work on the above. Data are tabulated and charted. 65 ref.

798* N-Substitution in Polyamides. J. R. Lewis and R. J. W. Reynolds. *Chemistry & Industry*, Nov. 10, 1951, p. 958-961.

Evaluates methods and effects of reducing hydrogen bonding between molecular chains in natural and synthetic linear polymers. 13 ref.

799* Heat Transfer in Industrial Polymerization. H. W. Ashton and M. D. Cooke. *Chemistry & Industry*, Nov. 10, 1951, p. 962-965.

Detailed discussion of the above covering various processes of polymerization.

800 Diffusion in High Polymers: Some Anomalies and Their Significance. J. Crank and G. S. Park. *Transactions of the Faraday Society*, v. 47, Oct. 1951, p. 1072-1084.

Discusses the above. Anomalous behavior is attributed to variable surface concentration, diffusion coefficient dependent on the history of the diffusion process, and stresses exerted on one part of the polymer sheet by other parts. Graphs. 14 ref.

801 Plastics for Chemical Plant. Part 2. *Industrial Chemist and Chemical Manufacturer*, v. 27, Nov. 1951, p. 492-495.

Refers to the numerous plastic products which have been developed during recent years and discusses their advantages and disadvantages for specific chemical engineering applications. In this section polytetrafluoroethylene, silicones, and other compounds are discussed.

802* The Elastic and Viscous Properties of Polystyrene in the Solid and Liquid State. H. W. Mohrman, R. Buchdahl, L. E. Neilsen, and E. H. Merz. *Journal of Applied Chemistry*, v. 1, Oct. 1951, p. 456-469.

Measurements on unfractionated and fractionated polystyrenes provided data from which several fundamental conclusions are drawn. 25 ref.

803 The Application of Nutting's Equation to the Viscoelastic Behavior of Certain Polymeric Systems. Rolf Buchdahl and Lawrence E. Nielsen. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1344-1349.

22 references.

804 Excluded Volume Effect in Polymer Chains. I. H. L. Frisch, F. C. Collins, and B. Friedman. *Journal of Chemical Physics*, v. 19, Nov. 1951, p. 1402-1409.

A mathematical treatment.

805 Viscosities of Concentrated Polyvinyl Acetate Solutions in Various Solvents. John D. Ferry, Edward L. Foster, George V. Browning, and W. M. Sawyer. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 377-388.

Viscosity measurements are reported on concentrated solutions of polyvinyl acetate in various solvents. The logarithm of the viscosity is not a linear function of the square root of either the weight or the volume concentration, although the deviation from linearity is not great for either. Data are graphed. 16 ref.

806 A Kinetic Basis for Polymer Precipitation and the Selection Average. D. R. Morey. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 406-415.

The kinetics of nucleation, and of further growth of a nucleus, are examined theoretically for the case of polymer chains in dilute solutions. The analysis was carried out using molecular weight as the prime variable, and the results were put into the form of a gamma average, which relates precipitation point and role of chain-length distribution. 13 ref.

807 Titration and Viscosity Studies of Two Copolymers of Maleic Acid. John D. Ferry, Doyle C. Udy, Feng Chi Wu, George E. Heckler, and David B. Fordyce. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 429-442.

Compares the behavior of a 1:1 copolymer of maleic anhydride and styrene with that of a corresponding copolymer of maleic anhydride and vinyl ethyl ether. The former exhibits some complicated phenomena, especially with respect to solubility and specific viscosity in dioxane-water mixtures, which are absent in the latter. Some titration data were also obtained to assist in interpretation of the viscosity results. Tables and graphs. 13 ref.

808 Delayed Plastic Flowing in Certain Polyamide Films. J. W. Kauffman and Waller George. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 450-469.

Presents experiments to demonstrate several characteristic ways in which the yield point and subsequent development and propagation of local necking in certain polymeric films may be described in terms of spatially local and delayed plastic flow. Data are graphed and tabulated. 20 ref.

809 The Application of Precipitation-Turbidity Analysis to Polyvinyl Acetates. D. R. Morey, E. W. Taylor, and G. P. Waugh. *Journal of Colloid Science*, v. 6, Oct. 1951, p. 470-480.

Describes the above with the purpose of determining the variations in molecular-weight distribution of the acetates made in different ways. Data are tabulated and graphed.

810 Intrinsic Viscosities of Cellulose As Affected by Rate of Shear. Carl M. Conrad, Verne W. Tripp, and Trinidad Mares. *Journal of Physical & Colloid Chemistry*, v. 55, Dec. 1951, p. 1474-1491.

Presents an attempt to determine the extent of the effect of uncontrolled and several selected controlled velocity gradients of flow on intrinsic viscosities of celluloses, covering a wide range of degrees of polymerizations and in 2 different though related solvents. Also includes a consideration of several formulas for the extrapolation of concentration and a study of the relation of velocity gradient to the concentration slope constants of the Martin and the Huggins equations. Tables and graphs. 23 ref.

811 Properties of an Amphoteric Polymer of Vinylpyridine and Acrylic Acid. H. L. Wagner and F. A. Long. *Journal of Physical & Colloid Chemistry*, v. 55, Dec. 1951, p. 1512-1527.

The above are given and compared with the parent ester polymer. Data are graphed and tabulated. 24 ref.

812 Processes Used in Bonding Metals. F. H. Parker. *Light Metals*, v. 14, Nov. 1951, p. 597-603.

Discusses the above, with emphasis on the Redux process. Includes details of curing equipment, preparation for curing, the curing process, testing and inspection procedures, and advantages of metal-to-metal bonding.

813 Recent Development in Ethoxyline Resins. Phil E. Preiswerk. *Light Metals*, v. 14, Nov. 1951, p. 594-597.

Discusses the above, with special emphasis on their use for joining metals to metals, metals to non-metals, etc.

814 How Glass Reinforced Plastics Are Molded. *Machine Design*, v. 23, Dec. 1951, p. 154-155.

Describes and illustrates the above.

815 How to Machine Laminated Plastics of the Asbestos, Glass and Graphite Grades. Lewis C. Rowland. *Materials & Methods*, v. 34, Nov. 1951, p. 82-84.

Recommended practices are given for machining, sawing, shearing and punching, drilling and broaching.

816 Low Temperature Behavior of Plastics. H. K. Nason, T. S. Carswell, and C. H. Adams. *Modern Plastics*, v. 29, Dec. 1951,, p. 127-128, 130, 134-136, 138, 140, 198, 200-201, 203.

Discusses the above. When exposed to low temperatures, organic plastics undergo changes which may be classified broadly as reversible or irreversible. In either classification, extent and rapidity of every effect varies greatly, depending upon specific environmental conditions and the particular material involved. Tables and graphs. 39 ref.

817 Viscosity of Dilute and Moderately Concentrated Polymer Solutions. S. G. Weissberg, Robert Simha, and S. Rothman. *Journal of the National Bureau of Standards*, v. 47, Oct. 1951, p. 298-314.

Results of precise measurements of moderately concentrated solutions of 3 polystyrene fractions in 3 different solvents are described. The data are expressed by means of customary empirical expressions, as well as by power-series developments, in order to reach theoretical conclusions. Experimental procedures and the materials used are reviewed. Results are tabulated, and described in terms of various concentration functions. 26 ref.

818 Effects of X-Rays Upon Plastics. Electronic Process. M. J. Day and Gabriel Stein. **Paramagnetic Resonance.** E. E. Schneider, M. J. Day, and Gabriel Stein. *Nature*, v. 168, Oct. 13, 1951, p. 644-645.

Surveys the above. Data are graphed.

819 Measurements of the Normal Stress Effect in Solutions of Polyisobutylene. H. W. Greensmith and R. S. Rivlin. *Nature*, v. 168, Oct. 13, 1951, p. 664-665.

Describes an investigation on the above. Indications show that in high-polymer solutions, steady-state laminar flow cannot be maintained by the action of shearing forces alone, even at low-velocity gradients for which centrifugal effects can be neglected.

820* Sizings, Coatings, Adhesives. V. V. Vallandigham, A. L. Magnuson, and A. Miller. *Paper Industry*, v. 33, Oct. 1951, p. 788-789.

Discusses film forming, penetration controlling, and suspending properties which make algin of growing importance to the paper industry for the above. (To be continued.)

821* Improved Resin Developed for Wet-Strength Papers. Robert P. Goodale. *Paper Trade Journal*, v. 133, Nov. 16, 1951, p. 20, 22, 24, 26.

Describes Uformite 700, a wet-strength resin which is characteristic of urea-formaldehyde types with a rapid rate of wet-strength development and adaptability to a variety of pulp furnishes.

822 A Vibrating Cantilever Method for the Investigation of the Dynamic Elasticity of High Polymers. K. W. Hillier. *Proceedings of the Physical Society*, v. 64, sec. B, Nov. 1, 1951, p. 998-1005.

A method of measuring the dynamic elasticity at frequencies about 20 c/s. to 100 c/s. was designed and operated. Measurements accurate to within one or 2% can be obtained by this method. 12 ref.

823* Some Recent Work on Diffusion in High Polymers. J. Crank and G. S. Park. *Research*, v. 4, Nov. 1951, p. 515-520.

A review. 30 ref.

824* Reduction of the Gas Permeability of Natural Rubber by Use of Fillers. (In French.) P. Thirion, G. J. van Amerongen, and R. Chasset. *Revue Générale du Caoutchouc*, v. 28, Oct. 1951, p. 684-691.

The ordinary fillers used in the rubber industry reduce only slightly the gas permeability of natural rubber mixes. But it has been possible to reduce this permeability to ⅓ of its previous value, in the case of pure-gum vulcanizates, by introducing 20 vol. of commercial mica or Al powder. The processing ability of these mixes is very good and they have been utilized in the pilot manufacture of low-permeability innertubes now undergoing road and other tests. Mechanism of this effect is discussed at length. Shows how to calculate the theoretical reduction of permeability due to the presence, in the vulcanizates, of spherical or lamellar fillers, assuming homogenous distribution. Validity of the theory was qualitatively checked by measurement of permeability coefficients, for nitrogen, or natural-rubber mixes containing spherical fillers (Whiting) or lamellar ones (Mica.)

825 Photoelectric Interferometer for High Polymer Research. *Rubber Age*, v. 70, Nov. 1951, p. 216-217.

Describes the above. The fully automatic instrument observes and plots the varying length of a polymeric sample against temperature over the range from −185° to +185°C. Transition temperatures are then readily obtained as discontinuities in the plotted curve or in its slope.

826 The Warren Plastics Plant. Louis R. Wanner. *Sylvania Technologist*, v. 4, Oct. 1951, p. 81-84.

Characteristics of the principal thermosetting and thermoplastic resins and their molding characteristics are described. Types of molding equipment and mold design are discussed in relation to the kind of resin to be used and the product to be manufactured. The general layout and routing procedures followed at the Warren, Pa., Plastic Div., Sylvania Electric Products, are briefly described.

827* Resin Bonding of Hardwood Fibers in Offset Papers. Bourdon W. Scribner, Merle B. Shaw, Martin J. O'Leary, and Joshua K. Missimer. *Tappi*, v. 34, Nov. 1951, p. 481-489.

An investigation was made of the application of resin bonding to the development of strength in offset papers made principally of short hardwood fibers which develop little strength by conventional beating. Melamine-formaldehyde resin was used. Graphs and tables.

828* Resin Bonding of Offset Papers Containing Mineral Fillers. Martin J. O'Leary, Bourdon W. Scribner, and Joshua K. Missimer. *Tappi*, v. 34, Nov. 1951, p. 506-511.

Gives the results of an investigation of the influence of mineral fillers on the beneficial effects of the binding resin, and effect of the resin on the retention of fillers in the papers. Graphs and tables.

829 The Incorporation of Acrylate Resins Into Regenerated Cellulose Fibers. Aleksander Nowakowski. *Textile Research Journal*, v. 21, Oct. 1951, p. 740-746. (Translated from the Polish.)

Dialysis experiments were carried out on a homologous series of polymethacrylates by using cellulose hydrate membranes of different origin. Essential results of attempts to incorporate acrylate resins, such as polymethylmethacrylate, into rayon fibers seems to be that the physical properties of the treated fibers (up to 10.5% resin uptake) are unchanged, although the acrylate resin is distributed homogeneously throughout the fiber cross section. 11 ref.

830 Abrasion-Resistance of Resin-Treated Fabrics. A. C. Nuessle. *Textile Research Journal*, v. 21, Oct. 1951, p. 747-749.

Data are tabulated, charted, and discussed.

831* Chain-Length Dependence of Volume Expansion Coefficient and Freezing Temperature of Fractionated Polystyrene. (In German.) Kurt Ueberreiter and Gerhard

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Kanig. *Zeitschrift für Naturforschung*, v. 6a, Oct. 1951, p. 551-559.
Graphs and tables summarize experimental and theoretical studies on above. 24 ref.

Books

832 Plastics: Scientific and Technological. Ed. 3. H. R. Fleck. 413 pages. 1951. Temple Press, Ltd., London, (TP986A2 F62p3)

Covers history, raw materials, theory of polymerization, chemistry, manufacture, physical properties of plastics, synthetic resins, fibers, and textiles, adhesives, plywood, impregnated wood, manufacture of dies and molds for plastics, and analysis of testing of raw materials and products.

833* British Catalogue of Plastics. An Encyclopaedia of Plastics. Ed. 3. 486 pages. 1950. National Trade Press, Ltd., London. (Directory Shelf)

Covers recent developments in materials and techniques; gives comprehensive account of applications. Materials section is designed to aid in selecting the correct type material for a particular product. Includes tables of properties, information on molding processes, methods of fabricating and finishing, and a buyer's guide.

See also:
93 (resin-fiberglas reinforcement of foundry cores)
145 (hot-air "welding" of plastics)
153 (synthetic-resin adhesives)
364 (corrosion-resistant plastics)
507 (creep of phenol-formaldehyde plastics)
692 (petroleum in the plastics industry)
791 (chlorotrifluoroethylene polymers)
838 (adhesion of rubbers to synthetic fabrics)
1038 (plastic printing plates)

29. RUBBERS AND OTHER ELASTOMERS

834* Comparison Between Synthetic and Natural Rubber Pipe-Joint Rings. W. L. White. *Journal American Water Works Association*, v. 43, Nov. 1951, p. 872-876.

835 Tyre Examination; Ultrasonic Equipment for the Detection of Cavity Faults. P. Hatfield. *Automobile Engineer*, v. 41, Oct. 1951, p. 385-388.

Describes and illustrates recommended equipment and procedures for inspection of pneumatic tires.

836* The Physical Properties of Amorphous Polymer Networks. L. R. G. Treloar. *Chemistry & Industry*, Nov. 10, 1951, p. 955-958.

Some of the more striking advances made in recent years in the application of statistical theories to the interpretation of physical properties of cross-linked high polymers of the rubber-like type are discussed. Confined to 3 topics: mechanical properties (stress-strain-relations), optical properties (strain-birefringence); and swelling phenomena. 16 ref.

837 Abrasion and Wear; International Symposium at the Rubber-Stichting, Delft. *India-Rubber Journal*, v. 121, Nov. 24, 1951, p. 4,6-8.

Presents summaries of 8 papers on the above. General trends in the problems of rubber abrasion were discussed.

838 Adhesion of Rubbers to Fabrics. R. C. Moakes. *India-Rubber Journal*. v. 121, Nov. 3, 1951, p. 7-10, 13.

Surveys the above. Methods for obtaining satisfactory adhesion of natural and synthetic rubbers and other high polymers to fabrics such as rayon, nylon, terylene, and orlon are discussed. 21 ref.

839 Determination of Free Sulphur in Dispersed Natural Rubber Vulcanisates in a Hydrocarbon Solution. F. B. Pande and C. S. Ramakrishnan. *India-Rubber Journal*, v. 121, Nov. 17, 1951, p. 9-10, 23.

Describes a volumetric method for the determination of sulfur present after vulcanization of a dispersion of rubber in decalin.

840* Mechanical Rubber Goods—With Special Emphasis on Latest Designs and Testing Methods for Automotive Parts. F. L. Haushalter. *India Rubber World*, v. 125, Nov. 1951, p. 181-186.

Describes how recent design of automotive rubber parts made from natural and increasing amounts of synthetic rubbers were accompanied by a trend toward the narrowing of specification limits for the compounds used and the demand that service life, particularly for military applications, be adequate at temperatures as low as 65°F. Diagrams and graphs.

841* The Molecular Weight of Guayule Rubber as Influenced by Extraction and Processing Treatments. J. W. Meeks and I. C. Feustel. *India Rubber World*, v. 125, Nov. 1951, p. 187-190.

Presents results of a study made to determine the relative extent of molecular-weight degradation that occurs in the several steps of the pebble-milling extraction process and related treatments. Viscosity measurements were believed to serve a very useful purpose in connection with the development of new or improved extraction and processing procedures for producing guayule rubber of uniform high quality. Graphs and tables.

842 Free Longitudinal Vibrations of Rubber and Tissue Strips. Richard W. Lawton and Allen L. King. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1340-1343.

Describes a study of the free longitudinal vibrations of several types of rubber and of tissue strips from young and old aortas. Data are graphed. Method is simple and rapid and is applicable to biological tissues as well as to other rubberlike substances.

843* Rapid Measurement of Plasticity. R. W. Whorlow. *Journal of Rubber Research*, v. 20, Nov.-Dec. 1951, p. 71-80.

Presents a review of plastimeters. Considers the merits of existing instruments, and ways of improving them, and shows by experimental results the most important features of rapid instruments for plasticity measurement for rubber stock. 11 ref.

844 Plasticizers for GR-S Gasket Stocks to Be Used at Low Temperatures. Ross E. Morris and Joseph W. Hollister. *Rubber Age*, v. 70, Nov. 1951, p. 195-203.

Plasticizers were tested in GR-S stock for extractability by water and volatility. Several GR-S stocks containing different plasticizers were checked for compression set at −60°, −30°, 0° and +30°F. after various recovery times. Data are graphed. 10 ref.

845 Silicone Rubber—A Literature Review. John B. Gregory. *Rubber Age*, v. 70, Nov. 1951, p. 211-215.

88 references.

846 The Rheology of Rubber Solutions and Suspensions. I. Rubber-Solvent Systems. Louis Leaman, *Rubber Age*, v. 69, Sept. 1951, p. 699-706.

The discussion of the investigation of rubber solutions and suspensions has been divided into two parts. This first part pertains to rubber organic solvent systems. 53 ref. (To be concluded.)

847* Action of Unsaturated Compounds on Natural Rubber in Solution. II. Reaction Caused by Heat Alone. (In French.) André Delalande. *Bulletin de la Société Chimique de France*, Sept.-Oct. 1951, p. 773-778.

Addition at 170°C. of maleic N-methylimide to natural rubber in solution was studied. Includes charts and tables. 12 ref.

848 Thermal Degradation of Tire Cords. Part I. Effects on Strength, Elongation, and Degree of Polymerization. Carl M. Conrad. Verne W. Tripp, and Trinidad Mares. *Textile Research Journal*, v. 21, Oct. 1951, p. 726-739.

Results of experiments on the above are charted, tabulated, and discussed. 19 ref.

See also:
692 (petroleum in the rubber industry)

30. PAINTS, VARNISHES, LACQUERS, AND ENAMELS

849* Why Paint Sometimes Blisters. *Engineering & Chemical Digest*, v. 3, Sept. 1951, p. 325.

Briefly discusses causes and remedies.

850 Subsidiary Paint Tests at Birmingham: Final Report. J. C. Hudson. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 153-156.

An exposure test over 15 yrs. confirmed that surface preparation is the most important single factor contributing to successful protection of iron and steel, by means of paint, against atmospheric corrosion. The average life of 2-coat painting schemes was nearly 6 times greater on a pickled surface than on a weathered and wire-brushed one. The best of the painting schemes tested—two coats of micaceous iron ore paint—protected pickled wrought iron perfectly. Even better results should be obtained by using a red-lead priming paint under a finishing coat of micaceous iron-ore paint. Heating to dehydrate the rust improved the performance of painting schemes.

851 Rate of Erosion, Hardness and Abrasion Resistance of Drying Oil Films. E. B. Kiser and J. H. Coulliertte. *Paint, Oil & Chemical Review*, v. 114, Nov. 22, 1951, p. 10, 12-14, 38, 40, 42-43.

Describes testing procedure and results of tests on pure paint vehicles and pigmented compounds prepared for the testing program of the Federation of Paint and Varnish Production Clubs. Data are charted.

852* Pigment Surface. H. Mills. *Journal of the Oil & Colour Chemists' Association*, v. 34, Nov. 1951, p. 497-517; disc., p. 517-518.

The development of pigmentary particles of lithopone from smaller precipitated particles is described, and a transition point in surface area and internal structure is correlated with rheological behavior. The relation of particle size to hiding power is discussed and suggestions made for the use of surface-active pigments. Micrographs, tables, and graphs. 10 ref.

853* The Measurement and Interpretation of Oil Absorption. G. E. Bessey and K. A. Lammiman. *Journal of the Oil & Colour Chemists' Association*, v. 34, Nov. 1951, p. 519-544; disc., p. 544-546.

Oil absorption may be defined as the number of grams of linseed oil (of specified quality) required by 100 grams of a powder to give a coherent product under certain defined conditions. Bulk-density measurements of powders and powder-oil mixes were used in a study of oil absorption of pigments, and particularly of whiting. It was shown that the "true" oil-absorption value is the proportion of oil required just to fill the voids in the close-packed powder; and that it is, for a given sample, a unique value independent of the observer. Graphs and tables. 26 ref.

854 Review of Pigment Progress. W. M. Morgans. *Paint Manufacture*, v. 21, Nov. 1951, p. 397-401, 423.

Presents a literature survey on the above. Considerable effort was devoted to the after treatment of pigments in order to improve the shelf life of paints containing them. Metal pigments are considered. 96 ref.

855 Phthalocyanine Pigments. I. S. Moll. *Paint Manufacture*, v. 21, Nov. 1951, p. 402-406, 418.

Describes recent progress and developments in the above. 17 ref.

856 Wet-Ground Mica. *Paint Manufacture*, v. 21, Nov. 1951, p. 407-411.

Presents a summary of the results of recent research on wet-ground mica in paint formulations.

857 Chemical Changes in Films With Aging. R. E. Dunbar. *Paint, Oil & Chemical Review*, v. 114, Nov. 8, 1951, p. 70-72.

Acid and saponification numbers of both clear and pigmented oils and compounds were determined over a period of several months. Each of the 23 pigmented films were also exposed on glass plates in a weatherometer for several months or until the films disintegrated, and were checked for pigment loss due to chalking at regular intervals. Data are tabulated.

858 Oxidation of Films of Unsaturated Fatty Acid Esters. J. R. Chipault and W. O. Lundberg. *Paint, Oil & Chemical Review*, v. 114, Nov. 8, 1951, p. 74-76, 78-79.

Studies of the oxygen absorption, peroxide accumulation, and ultraviolet spectral changes taking place during the autoxidation of various esters of pure fatty acids were made as one part of the research program of the Federation of Paint and Varnish Production Clubs. Results are presented in this report, but final conclusions will be withheld until the data from similar studies involving more detailed analyses of films of several esters have been completed.

859 Method of Measuring Dry Hiding Power of Paints. E. J. Dunn, Jr., L. A. Melsheimer, F. C. Schmutz, R. L. Whitney, and L. F. Andrews. *Paint, Oil & Chemical Review*, v. 114, Nov. 8, 1951, p. 100-102.

Presents results of comprehensive investigation of methods for the above. Describes apparatus and procedure developed to give both complete hiding power expressed as spreading rate per ft. per gal. and comparative hiding power expressed as contrast ratio obtained at a specified film thickness.

860 Flotation in Brunswick Green Paints. Lan Fergusion. *Paint Technology*, v. 16, Sept. 1951, p. 379-391.

Flotation is one of the disadvantages attending the use of Brunswick Green in paints. Several series of paints were prepared in order to determine the conditions under which flotation takes place. Effects of different extenders, medium, solvents, and driers are discussed. Different grinding procedures were used, and the effect of various additives was also evaluated. Test-panel photographs and tables.

861 Hot-Spraying of Nitrocellulose Lacquers. Rufus F. Wint. *Paint Technology*, v. 16, Oct. 1951, p. 439-440; disc., p. 440, 449. (A condensation.)

Reports results of an investigation of the factors affecting the application of hot lacquer. Data are tabulated.

862 Fungicides in Paints and Other Protective Coatings. W. H. Ritchie. *Paint Technology*, v. 16, Nov. 1951, p. 481-484.

Surveys the above including developments within recent years. Properties of some fungicidal chemicals are given.

863* Development and Research in the Coatings Materials Industry. Part II. Factual Information—the Starting Point of Research and Development. Howard C. Woodruff. *Paint and Varnish Production*, v. 41, Nov. 1951, p. 24-27, 54.

Discusses the proper handling of information about materials, conditions, results, markets, specifications, demands, uses, and effects.

864* Basic Research and Test Methods Applied to Organic Finishes. Allen G. Gray. *Products Finishing*, v. 16, Nov. 1951, p. 60, 62, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86.

Reviews at length several recent papers on the above, including some presented at Second Symposium on Varnish and Paint Chemistry. Various test methods of evaluating properties of films are presented. Illustrations.

865 Selecting Organic Coatings for Metal Products. *Product Engineering*, v. 22, Dec. 1951, p. 173-180.

Discusses the factors affecting the above. Types of organic coatings and their principal uses are outlined. Illustrations.

866* Research Shows Coatings Prolong Life of Crossties. T. G. Gill. *Railway Engineering and Maintenance*, v. 47, Nov. 1951, p. 1007-1009.

A program of cooperative research to find ways of lengthening the service life of crossties has been under way at the laboratories of Timer Engineering Co. since 1948 under the joint sponsorship of Association of American Railroads and National Lumber Manufacturers Association. Reports on preliminary results of some of the studies being carried out under that program.

Books

867 Paint Film Defects. Their Causes and Cure. Ed. 3. Manfred Hess. 544 pages. 1951. Reinhold Publishing Corp., New York. (TP939 H46ptr.)

Reference book for causes and remedies for paint failures. Covers various materials, their application, and storage. The defects are arranged in accordance with a logical classification system and are discussed in turn. Includes coatings on both metals and nonmetals. Numerous illustrations, footnote references, and bibliography.

30. *Paints, Varnishes, Lacquers, and Enamels*

See also:
184 (metal plating on plastics)
216 (stainless-steel powder and vinyl resin for protective coating)
429 (detection of metals in oils and varnishes)
692 (petroleum in the paint industry)
796 (chlorinated polyphenyls in surface coatings)

31. AGRICULTURAL RESEARCH

868* Basis for Progress: Pesticide Research. *Agricultural Chemicals*, v. 6, Nov. 1951, p. 33-34, 105, 107, 109.

Discusses importance of above research to health, timber, clothing, food, etc.

869* Insecticide Formulation. Robert D. Chisholm. *Agricultural Chemicals*, v. 6, Nov. 1951, p. 36-37, 109, 111.

A USDA chemist discusses factors involved in the selection of surface-active agents for emulsifiable insecticide formulations. Data on 35 commercially available non-ionic surface-active agents are tabulated.

870* The Determination of the Availability of Nitrogen in Nitrogenous Fertilizers. Part II. J. Hubert Hamence. *Analyst*, v. 76, Oct. 1951, p. 563-571; disc., p. 571-572.

In 1949 the author described a method for the above based upon determination of nitrate produced when the fertilizer is mixed with soil under conditions that give maximum nitrification. This test has now been applied to the majority of the common nitrogenous fertilizers and results are given. Tables and graphs.

871 Hollow Cylinder Method of Measurement of P^{32} in Plants. A. M. Kristjanson, H. G. Dion, and J. W. T. Spinks. *Canadian Journal of Technology*, v. 29, Nov. 1951, p. 496-501.

Discusses and diagrams the above method effected by compressing plant material containing radioactive P into the form of a hollow cylinder and placing around a thin-wall Geiger tube.

872* Untapped Resources; Wild Plants. C. O. Willits. *Chemurgic Digest*, v. 10, Nov. 1951, p. 4-8.

Surveys research on the above. Discusses the search for various constituents and the plants they were found in.

873* Nitrification in Relation to Cation Absorption by Plants. S. V. Desai and B. V. Subbiah. *Proceedings of the Indian Academy of Sciences*, v. 34, sec. B, Aug. 1951, p. 73-80.

Studies on the above show that nitrate appears to have a definite role in the absorption of cations whatever may be the actual mechanism of absorption. The chemical composition of a number of plants indicates that there is a close relationship between nitrogen and cations absorbed. Data are tabulated. 20 ref.

874 More Food and Better Health. Clyde Williams. *Monthly Business Review*, v. 33, Dec. 1, 1951, p. 12.

Discusses the world's food problem from the aspects of diminishing acreage, steadily increasing populations, and inadequate nutrition due to mineral deficient soil. Shows the correlation between the health of the people and the soil which sustains them.

875 Selenium Toxicity Associated With an Irish Soil Series. T. Walsh and G. A. Fleming, R. O'Connor and A. Sweeney. *Nature*, v. 168, Nov. 17, 1951, p. 881.

Examination of soil and herbage samples revealed severe disorder in horses and cattle due to Se toxicity. Discusses area as to soil type, drainage, rainfall, elevation, etc.

876* Rapid Methods for Determining Different Types of Sulphur Compounds in Soil. J. Smittenberg, G. W. Harmsen, A. Quispel, and D. Otzen. *Plant and Soil*, v. 3, Oct. 1951, p. 353-360.

Describes the above, together with a few general remarks concerning their suitability. Data are tabulated.

877* The Use of *Aspergillus Niger* (Van Tiegh.) M Strain As a Test Organism in the Study of Molybdenum As a Plant Nutrient. E. J. Hewitt and D. G. Hallas. *Plant and Soil*, v. 3, Oct. 1951, p. 366-408.

Describes experiments to test the factors determining consistently efficient removal of molybdenum contamination in reagents, water and other culture materials and to develop a reliable procedure for detection and estimation of such contamination. 33 ref.

Books

878 Agricultural Chemistry; A Reference Text. Vol. 2. Practical Applications of Agricultural Chemistry. Donald E. H. Frear, editor. 588 pages. 1951. D. Van Nostrand Co., New York. (S585 F87a)

Presents a detailed discussion on the above. Individual chapters were written by specialists in their fields.

879 Forages. The Science of Grassland Agriculture. H. D. Hughes, Maurice E. Heath, and Darrel S. Metcalfe, editors. 724 pages. 1951. Iowa State College Press, Ames, Iowa. (SB193 H87f)

52 contributing authors selected for leadership in the field of grassland agriculture deal individually with phases of forages and productive agriculture, grasses and legumes, forage production practices and utilization.

880 Soils: Their Genesis and Classification. C. F. Marbut. 134 pages. 1951. Soil Science Society of America. (S591 M32s)

Volume of 10 lectures regarding the above, given at the Graduate School, U. S. Dept. of Agriculture, 1928.

881 Advances in Agronomy. Vol. III. A. G. Norman. 361 pages. 1951. Academic Press, New York. (S405 A95)

Topics reviewed are those of interest and assistance to agronomists in general. Soil-plant relationships form the recurrent theme. Departs from previous volumes in discussing agronomic changes brought about in England and Wales. 9 contributors.

See also:
435 (trace amounts of boron in agricultural samples)
1054 ("Agricultural Marketing"—book)

32. PHYSICS

882* Resistivity of Zinc, Nickel, Cobalt, Magnesium, and Copper Ferrites As a Function of Temperature. (In French.) Louis Bochirol. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 1, 1951, p. 736-738.

Presents results of experiments on the above between 100 and 700°C. Compares results with those of previous investigators and discusses their theoretical interpretation.

883* Condensed Electrical Discharges in Compressed Gases. (In French.) Roger Aumont. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 1, 1951, p. 740-742.

Describes experimental work on above using two types of non-condensed discharges in gases under pressure: the normal condensed spark and the superficial condensed spark.

884* Infrared Stimulation of the Phosphoresence of Calcium-Oxide-Base Luminescent Substances. (In French.) Joseph Janin, Albert Crozer, and Pierre Clerc. *Comptes Rendus hebomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 934-936.

The effect of various binary-alloy metal activators on the above was investigated.

885* Application of the Lighthill Method to Plane Supersonic Flow. (In French.) Jean Legras. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 29, 1951, p. 1005-1010.

Presents mathematical analysis of above methods.

886* Mechanism of the Atomizing of Electrolytic Solutions by an Anodic Spark Discharge. (In French.) Pierre Barret and Pierre Gérard. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1090-1092.

Outlines experiments on the above.

887* An Effect of Light on Semiconductors; Variation of the Contact Potential Difference. (In French.) Werner Veith and Gérard Wlérick. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1097-1099.

Above was investigated, noting and measuring the variation caused by light on the contact potential of a semiconducting CdS coating produced and kept in a vacuum.

888* High Speed Flight Phenomena. Milton Rogers. *Aero Digest*, v. 63, Dec. 1951, p. 98-104.

Discusses factors important in the aerodynamics of high speed flight and parameters involved in the study of buffetting.

889 On Aerophysics Research. R. J. Seeger. *American Journal of Physics*, v. 19, Nov. 1951, p. 459-469.

Deals with the scope of the borderline field between aerodynamics and physics, which has become known as aerophysics. Emphasizes the desirability of utilization of ballistics ranges for aerophysics investigation. Previews in outline form, the history of ballistics; the age of speculative, geometrical and physical ballistics. Examples are cited from aeroballistics investigations conducted at the Naval Ordnance Laboratory, White Oak, Md. Illustrations. 39 ref.

890* Recent Contributions to the Theory of Plasticity. William Prager. *Applied Mechanics Reviews*, v. 4, Nov. 1951, p. 585-588.

A review. Numerous references throughout the text.

891* The Surface Loss Correction for Nuclear Emulsions. S. L. Martin. *Australian Journal of Scientific Research*, ser. A, v. 4, Sept. 1951, p. 296-304.

Formulas are developed for the case of particles recoiling from a mono-energetic beam of particles incident at any angle on the surface. The effect of small-angle scattering is neglected, but it is believed that the formulas are valid for recoil energies at least as great as 5 MeV. Curves are given from which the factor can be obtained in any given case.

892* Fluid Flow in Ducts With a Uniformly Distributed Leakage. J. F. Holdsworth, F. W. Pritchard, and W. H. Walton. *British Journal of Applied Physics*, v. 2, Nov. 1951, p. 321-324.

Considers the above for any power-law relationship between flow rate and pressure gradient and between leakage rate and excess pressure in a duct. The results relate pressure drop, inlet flow rate, and outlet flow rate for a leaking duct to pressure drop and flow rate in a similar leakless duct. Shows that these quantities can be conveniently obtained using a nomogram involving a resistance constant and a leakage constant for the duct. Assumptions involved are discussed and a model experiment is described which confirms results of the theoretical treatment.

893* The Design and Use of An Admittance Bridge for Piezoelectric Crystals. J. F. W. Bell. *British Journal of Applied Physics*, v. 2, Nov. 1951, p. 324-327.

A radio-frequency bridge for the rapid measurement of resistance and Q-factor of piezoelectric crystals is described. The limitation of the accuracy of measurement due to frequency fluctuations of the generator used and to variations in the stray capacity of the variable resistance arm of the bridge is discussed. Examples of the use of the bridge at 250 kc./s. are given.

894 How to Understand Problems of Terminal Velocity. Arthur H. Korn. *Chemical Engineering*, v. 58, Nov. 1951, p. 178-179.

All processes where solids must be suspended in a fluid involve the concept of terminal velocity. Presents mathematical and graphical explanation.

895* Designing for Nuclear Shielding. H. M. Glen. *Civil Engineering*, v. 21, Nov. 1951, p. 51-53.

Presents basic design data for construction of cells, barricades, and other forms of personnel shielding from radioisotopes.

896 Luminescence Effects Associated With the Production of Silicon Monoxide and With Oxygen Deficit in Silica. J. Ewles and R. F. Youell. *Transactions of the Faraday Society*, v. 47, Oct. 1951, p. 1060-1064.

Describes the above. Relation of the results to other work on SiO and to recent ideas on the nature of silica surfaces is briefly discussed.

897* Thermo-Optic Behaviour of Silicon Carbide. A. K. Ramdas. *Proceedings of the Indian Academy of Sciences*, v. 34, sec. A, Aug. 1951, p. 136-140.

Data on the above are tabulated and compared with those for diamond.

898* International Heat Transfer Conference. *International Chemical Engineering & Process Industries*, v. 32, Nov. 1951, p. 529-532.

Presents a summary of 9 papers read at above conference recently held in London.

899 The Dielectric Breakdown of Some Simple Organic Liquids. B. Salvage. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 4, Oct. 1951, p. 15-22.

Development of a method measuring the electric strength of liquid dielectrics with d.c., a.c., and impulse voltage, is described. Experiments on normal hexane show that, when the electrode system is thoroughly cleaned and the liquid carefully filtered, electric strength is independent of form and duration of the applied voltage and dielectric thickness. Investigations on a series of liquid normal paraffin hydrocarbons (pentane to nonane) show that electric strength increases as chain length of the molecule increases. Experimental results are discussed in relation to existing theories of dielectric breakdown in liquids and solids. 27 ref.

900* Aerodynamic Coefficients of an Oscillating Airfoil in Two-Dimensional Subsonic Flow. R. Timman, A. I. van de Vooren, and J. H. Greidanus. *Journal of the Aeronautical Sciences*, v. 18, Dec. 1951, p. 797-802, 834.

A method yielding a direct solution in terms of known functions is presented for the above. Results are presented for 5 different values of Mach Number: 0.35, 0.5, 0.6, 0.7, and 0.8.

901* The Classification of One-Dimensional Flows and the General Shock Problem of a Compressible, Viscous, Heat-Conducting Fluid. Geoffrey S. S. Ludford. *Journal of the Aeronautical Sciences*, v. 18, Dec. 1951, p. 830-834.

12 references.

902 The Influence of Magnetic Fields Upon the Propagation of Electromagnetic Waves in Artificial Dielectrics. E. R. Wicher. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1327-1329.

An effect corresponding to the Faraday effect in natural dielectrics is predicted for a class of artificial dielectrics because of the existence of a Hall effect in the metallic components of the structure. Prospects for the application of these effects are briefly considered.

903 Magnetochemistry of the Heaviest Elements. Part IV. Plutonium Trifluoride and Trichloride. J. K. Dawson, C. J. Mandleberg, and D. Davies. *Journal of the Chemical Society*, Aug. 1951, p. 2047-2050.

Magnetic susceptibilities of above compounds were measured over the range 90-600°K.

904 Barium Titanium Phosphate: A New Phosphor. S. T. Henderson and P. W. Ranby. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 479-482.

Describes the preparation and some of the more important characteristics of the new phosphor, and discusses the position of this material in relation to other inorganic phosphors.

905 On the Foundations of Certain Theories of Turbulence. M. Z. v. Krzywoblocki. *Journal of the Franklin Institute*, v. 252, Nov. 1951, p. 409-412.

Briefly discusses the foundations of modern theories of turbulence based on hydrodynamic equations. It is shown that these theories offer only a limited number of possible solutions.

906 Ultraviolet Spectral Sensitivity Characteristics of Photomultipliers Having Quartz and Glass Envelopes. L.

32. *Physics*

Dunkelman and C. Lock. *Journal of the Optical Society of America,* v. 41, Nov. 1951, p. 802-804.

The above was measured using a vacuum grating monochromator equipped with a thermocouple for measuring the absolute energy at the exit slit. The radiation source was a hydrogen discharge tube.

907 Low Temperature Luminescence of Inorganic Solids. Clifford C. Klick. *Journal of the Optical Society of America,* v. 41, Nov. 1951, p. 816-823.

The emission spectra of a representative group of inorganic solid phosphors were measured at temperatures as low as 4°K. Of the phosphors investigated, only those having "edge" emission show a tendency to exhibit a line spectrum at low temperatures; the ordinary impurity-activated materials show little or no change in emission below 100°K. Data are graphed. 25 ref.

908 Slow-Neutron Ternary Fission of Uranium-235. E. W. Titterton. *Nature,* v. 168, Oct. 6, 1951, p. 590-591.

Surveys literature on the above. 17 ref.

909 A Photo-Conductive Effect in Tellurium Film. T. Blackband. *Nature,* v. 168, Oct. 20, 1951, p. 704.

Reports an investigation on the above. Resistivity of a Te film decreases on exposure to sunlight.

910 Temperature Dependency of Half Line-Width in Ferrite. Tosihiko Okamura and Yosiharu Torizuka. *Nature,* v. 168, Nov. 17, 1951, p. 872.

Briefly discusses method and results of an experimental investigation of the above in ferromagnetic resonance absorption. Tables showing changes of line-width for $MgOFe_2O_3$ and $CuOFe_2O_3$.

911 Effect of a Magnetic Field on the Propagation of Sound Waves in a Ferromagnetic Material. J. De Klerk. *Nature,* v. 168, Dec. 1, 1951, p. 963-964.

An investigation of the above using transverse and longitudinal magnetic fields is presented. Data are graphed.

912* The Angular Distribution of the Secondary Electrons of Nickel. J. L. H. Jonker. *Philips Research Reports,* v. 6, Oct. 1951, p. 372-387.

The common equipment for measuring secondary emission (disc-shaped or spherical electrode within a sphere) is not suitable for obtaining data about the angular distribution of secondary electrons. For this purpose, an electrode system with two concentric spheres was constructed. Distribution of secondary electrons was measured as a function of angle of incidence and of bombardment voltage of the primary electrons.

913* New Views on Oxidic Semi-Conductors and Zinc-Sulphide Phosphors. E. J. W. Verwey and F. A. Kröger. *Philips Technical Review,* v. 13, Oct. 1951, p. 90-95.

Following a brief discussion of the semiconducting elements Si and Ge and of nonstoichiometric oxidic semiconductors, the "method of controlled valency" is described by taking nickel oxide as an example. Method consists in bringing about desired changes in valency by the admixing of suitable "impurities."

914* The Melting Curve at High Pressures. C. Domb. *Philosophical Magazine,* ser. 7, v. 42, Nov. 1951, p. 1316-1324.

An attempt is made to derive theoretically the Simon formula for variation of the melting point of solid with pressure. The model used is similar to that of Lennard Jones and Devonshire, but interpretation of the results is different. A formula of the right type results, but a detailed examination shows that the melting temperatures are much too high. Reasons for the discrepancy are discussed.

915 Dielectric Properties of Lead Zirconate. G. Shirane, E. Sawaguchi, and Y. Takagi. *Physical Review,* ser. 2, v. 84, Nov. 1, 1951, p. 476-481.

Dielectric response of $PbZrO_3$ ceramic to biasing d.c. field was examined. In contrast to ordinary ferroelectrics, an effect is scarcely detected below the Curie point of 233°C. even up to a field strength of 20 kv./cm., except for a slight increase of permittivity in the vicinity of the transition point. In addition, Curie temperature decreases with increasing biasing field. Hysteresis loops of this ceramic were studied. Experimental facts all seem to suggest that $PbZrO_3$ may be, not ferroelectric, but antiferroelectric. 14 ref.

916 On the Photoelectric Emission and Energy Structure of BaO. L. Apker, E. Taft, and J. Dickey. *Physical Review,* ser. 2, v. 84, Nov. 1, 1951, p. 508-511.

Spectral distributions of the photoelectric yield and energy distributions of the photoelectrons were obtained for BaO surfaces made in widely different ways. Data are charted and discussed. 13 ref.

917 Magnetic Susceptibility of Manganese Selenide. Robert Lindsay. *Physical Review,* ser. 2, v. 84, Nov. 1, 1951, p. 569-571.

The susceptibility-temperature relation for MnSe was measured between 70° and −196°C. Evidence was found for a large thermal hysteresis and for dependence of susceptibility on field strength. A tentative theory is advanced to explain the thermal hysteresis in terms of 3 phases which possess different susceptibilities.

918 Conductivity of the Sodium Tungsten Bronzes. B. W. Brown and E. Banks. *Physical Review,* ser. 2, v. 84, Nov. 1, 1951, p. 609-610.

Measurements reported were made by a potential probe method (to eliminate contact effects) over a temperature range of −160 to +360°C., for single crystals of 6 different compositions. The results indicate a linear temperature dependence of resistivity over the entire temperature range studied. This is quantitative confirmation of the metallic nature of conduction in these materials.

919 Electron-Hole Production in Germanium by Alpha-Particles. Kenneth G. McKay. *Physical Review,* ser. 2, v. 84, Nov. 15, 1951, p. 829-832.

The above was determined by collecting the internally produced carriers across a reverse-biased n-p junction. No evidence is found for trapping of carriers in the barrier region. Studies of individual pulses show that the carriers are swept across the barrier in a time of less than 2×10^{-8} sec.

920 The n-p-n Junction as a Model for Secondary Photoconductivity. Kenneth G. McKay. *Physical Review,* ser. 2, v. 84, Nov. 15, 1951, p. 833-835.

The above was subjected to α-particle bombardment. The transient currents resulting from individual incident alpha particles were studied. This enables a study of the rate of decay of excess holes in the p-region.

921 Phase Transitions in Solid Solutions Containing $PbZrO_3$. Gen Shirane. *Physical Review,* ser. 2, v. 84, Nov. 15, 1951, p. 854-855.

A study of solid solutions of $PbZrO_3$ and $PbTiO_3$ revealed that when some of the Zr ions in $PbZrO_3$ are replaced by Ti ions, a ferroelectric intermediate phase can be observed between the para-electric and antiferro-electric phases. The $(Pb\text{-}Ba)ZrO_3$ and $(Pb\text{-}Sr)ZrO_3$ systems were investigated to determine whether such an intermediate phase can be observed in these systems.

922 Ionization Potentials and Probabilities Using a Mass Spectrometer. R. E. Fox, W. M. Hickam, T. Kjeldaas, Jr., and D. J. Grove. *Physical Review,* ser. 2, v. 84, Nov. 15, 1951, p. 859-860.

A method for determining ionization potentials and ionization probability curves was devised which eliminates the difficulties arising from uncertainties in the energy of the bombarding electrons. Diagrams are given.

923 Evidence for Production of Hole Traps in Germanium by Fast Neutron Bombardment. J. W. Cleland, J. H. Crawford, Jr., K. Lark-Horovitz, J. C. Pigg, and F. W. Young, Jr. *Physical Review,* ser. 2, v. 84, Nov. 15, 1951, p. 861-862.

The conductivity of 5 low resistivity p-type Ge single crystals was followed during fast-neutron bombardment in an Oak Ridge pile. The initial rate of change in carrier concentration per incident neutron, the original hole concentration, and the exposure temperature for these samples are given. Tables.

924 A General Formula for the Conductivity of a Gas Containing Free Electrons. L. G. H. Huxley. *Proceedings of the Physical Society*, v. 64, sec. B, Oct. 1, 1951, p. 844-861.

Presents a general discussion of electron drift in gases according to the method of free paths in which a fallacy contained in some earlier treatments is avoided. A general formula is derived for drift velocity in an electric field which is an arbitrary function of the time, and from it formulas for drift velocities in various special cases of importance are deduced. Applications of the formulae to ionospheric and other studies are mentioned. 11 ref.

925 Outer Brillouin Zones for Face-Centred and Body-Centred Cubic Lattices. J. F. Nicholas. *Proceedings of the Physical Society*, v. 64, sec. B, Nov. 1, 1951, p. 953-956.

In order to resolve some inconsistencies in the literature on the 2nd Brillouin zones of cubic lattices, the shapes of these zones were recalculated. The results, together with descriptions of the 3rd and 4th zones, are given.

926 Ferromagnetic Resonance and the Internal Field in Ferromagnetic Materials. J. R. MacDonald. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 968-983.

Deals with the forces which influence the direction of the magnetization vector of a ferromagnetic substance in an external magnetic field and with the effects of these forces upon some of the phenomena of ferromagnetic resonance. A macroscopic viewpoint is adopted throughout, and all microscopic interactions are replaced by formulas for the magnetic potential energy density of the materials which involve the macroscopic magnetization vector. 22 ref.

927 A Study of Rectification Effects at Surfaces of Germanium and Lead Sulphide. C. A. Hogarth and J. W. Granville. *Proceedings of the Physical Society*, v. 64, sec. B, Nov. 1, 1951, p. 992-998.

Describes experiments showing how various treatments given to the surface of Ge and PbS can modify their rectifying properties. Data are tabulated and graphed.

928 The Long-Wave Limit of Infra-Red Photoconductivity in PbSe. A. F. Gibson, W. D. Lawson, and T. S. Moss. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 1054-1055.

The photoconductivity of a PbSe photodiode consisting of a PbSe p-type crystal and a tungsten cats whisker, was studied. Wave lengths are graphed.

929 Fluctuations in the Energy-Loss of Fast Electrons in a Proportional Counter. P. Rothwell. *Proceedings of the Physical Society*, v. 64, sec. B, Oct. 1, 1951, p. 911-915.

Presents results of a study on the above. The experimental distribution is in agreement with the theoretical on the high-energy side of the peak, but is wider than previous predictions on the low-energy side; this discrepancy is greater in krypton than in argon. The experimental values of the most probable energy loss agree with theoretical values.

930 The Magnetic Properties of α-Ferric Oxide. W. P. Osmond. *Proceedings of the Physical Society*, v. 64, sec. B, Oct. 1, 1951, p. 931-932.

Presents results of an attempt to combine two basic theories on the above.

931 On the Mechanical Action in Dielectrics. W. B. Smith-White. *Proceedings of the Physical Society*, v. 64, sec. A, Oct. 1, 1951, p. 945-946.

Presents a new interpretation of the Poisson-Kelvin hypothesis as related to the above.

932 Residual Resistance in an Extremely Impure Semiconductor. R. W. Wright. *Proceedings of the Physical Society*, v. 64, sec. A, Oct. 1, 1951, p. 949-950.

Studies on the above were made with samples of CdO containing a large excess of Cd. Possible application of test results to the problem of transition was discussed.

933* Heat Transfer Equipment Analysis by the Resistance Concept. Carl F. Kayan. *Refrigerating Engineering*, v. 59, Dec. 1951, p. 1195-1199, 1240-1241.

Presents a study of heat-exchange performance by means of electrical analogy. The thermal resistance is determined by the physical characteristics of the heat flow path.

934* Heat Transfer From Humid Air to Metal Under Frosting Conditions. K. O. Beatty, Jr., E. B. Finch, and E. M. Schoenborn. *Refrigerating Engineering*, v. 59, Dec. 1951, p. 1203-1207.

Presents an investigation of the effects of frosting on heat transfer. Results are presented of measurements on a 4-ft. long surface and on a 4-in. long unit showing some of the effects of air velocity, air conditions, and cold surface temperature. The results obtained are analyzed and compared with predicted values.

935* Recent Developments in Luminescent Materials. S. T. Henderson. *Research*, v. 4, Nov. 1951, p. 492-497.

Reviews the above. 105 ref.

936 The Copper Oxide Rectifier. Walter H. Brattain. *Reviews of Modern Physics*, v. 23, July 1951, p. 203-212.

Presents an analysis of the conductivity in the body of the oxide layer to determine the concentration and energy of the impurity centers; an analysis of the junction capacity and of its dependence on applied bias voltage to determine the barrier height and the concentration of impurity centers in the barrier region; and an analysis of the d.c. characteristic and of its dependence on temperature. Graphs and tables. 21 ref.

937 A Note on the Pseudo-Stationary Flow Behind a Strong Shock Diffracted or Reflected at a Corner. Doris M. Jones, P. Moira E. Martin, and C. K. Thornhill. *Proceedings of the Royal Society*, ser. A, v. 209, Oct. 23, 1951, p. 238-248.

Mathematical analysis and graphical interpretation.

938 The Mach Reflection of Shock Waves at Nearly Glancing Incidence. C. H. Fletcher, A. H. Taub, and Walker Bleakney. *Reviews of Modern Physics*, v. 23, July 1951, p. 271-286.

Presents and discusses 3 mathematical methods for the above.

939 Wind Tunnel Test of a Wing of Finite Aspect Ratio of Symmetrical Double Wedge Section at Supersonic Speeds. P. L. Orman, R. S. Rae, and G. N. Ward. *Proceedings of the Royal Society*, ser A, v. 209, Nov. 7, 1951, p. 309-324.

Tests were carried out on a wing of symmetrical double wedge or rhombus section, 10% thickness, for aspect ratios 1.5, 1.25, 1.0 and 0.75 at Mach numbers 1.3, 1.5 and 2.3. The wing was attached to the tunnel wall, and the results include the effect of the boundary layer on this wall. Lift, wave drag, and normal force coefficients and the co-ordinates of the center of pressure are given. Graphs and tables.

940 The Thermal and Electrical Conductivity of Sodium at Low Temperatures. R. Berman and D. K. C. MacDonald. *Proceedings of the Royal Society*, ser. A, v. 209, Nov. 7, 1951, p. 368-375.

Modern theories of metallic conduction, based on the quantum interaction of electrons with the lattice vibrations, predict a considerable variation of Lorenz number and temperature. Measurements of the thermal and electrical conductivity of two pure specimens of sodium continuously from 90 to about 4°K were made, and an experimental Lorenz curve derived. Data are graphed. 22 ref.

941 The Diffraction of Thermal Neutrons by Single Crystals. G. E. Bacon. *Proceedings of the Royal Society*, ser. A, v. 209, Nov. 7, 1951, p. 397-407.

Presents experimental evidence in support of the above. It is shown that, under certain circumstances, single crystals, with their inherent advantages, can be used for neutron crystallography, thus extending the field of structure analysis beyond the limitations of the powder methods so far employed.

942* Some Aerodynamic Problems in Supersonic Design. H. O. Palme. *SAAB Sonics*, July-Sept. 1951, p. 14-17, 24.

Surveys the above. Includes graphs.

943* Fluorescence of Gases When Excited by α-Particles. (In German.) A. E. Grün and E. Schopper. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 698-700.

Above was investigated with the aid of secondary-electron amplifiers. Results show that the quantum yields of commer-

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cially pure N_2 and A are about 100 times those of H_2, O_2, and CO_2, while addition of organic vapors has an extinguishing effect. Apparatus is diagrammed.

944* The Permanently Polarized Dielectric. (In German.) Fritz Binder. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 714-718.

Explains the "electret" concept. Discusses phenomena that occur in permanently polarized dielectrics, and reports measurements on polyvinyl chloride. Charge distributions made visible by dusting demonstrate the transfer of charges between dielectric and electrode. Data are charted. 19 ref.

945* The Boundary Layer of a Germanium Plate Rectifier in the Flow Range. Preliminary Report. (In German.) W. Bösenberg and E. Fues. *Zeitschrift für Naturforschung*, v. 6a, Nov. 1951, p. 741-744.

The field and concentration distribution of the electrons and holes in the Schottky boundary layer of above contact rectifier was calculated. Data are charted and discussed.

946* Characteristics Method for the Approximate Computation of Unsymmetrical Supersonic Flow Around Annular Bodies. (In German.) Wolfgang Haack. *Zeitschrift für angewandte Mathematik und Physik*, v. 2, Sept. 15, 1951, p. 357-375.

947* The Temperature Dependence of the Fluorescence Spectrum of Anthracene Excited by Ligh and by Cathode Rays. (In German.) Konrad Hengst. *Zeitschrift für Naturforschung*, v. 6a, Oct. 1951, p. 540-543.

Experiments show that decreasing temperature increases the intensity of the bands of shortest wave length (at the expense of intensity of long-wave bands) of pure anthracene; the reverse is true when anthracene is in solid solution. Includes a diagram, graphs, and references.

Miscellaneous Publications

948 Fundamental Aspects of Diffusion in Solids. Frederick Seitz. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 77-146; disc. p. 146-148. (QC125 N21p)

Summarizes somewhat concisely the present status of the above. Emphasis was placed on the theory of the mechanism of diffusion rather than on a detailed compilation of empirical data pertaining to different substances, since several good compilations of this type are available in the literature. Theory is applied to metals. 39 ref.

949 Analysis of an Axial Compressor Stage With Infinitesimal and Finite Blade Spacing. H. J. Reissner and L. Meyerhoff. National Advisory Committee for Aeronautics, Technical Note 2493, Oct. 1951, 32 pages. (TL570 Un3t)

The theory of a flow through a system of infinitesimally spaced surfaces is formulated by means of a continuous axially symmetric force field which is uniform in the circumferential direction.

950 Contributions to the Theory of the Spreading of a Free Jet Issuing From a Nozzle. Part I. The Flow Field in the Core Region. W. Szablewski. National Advisory Committee for Aeronautics, Technical Memorandum 1311, Nov. 1951, 72 pages. (Translated from Untersuchungen und Mitteilungen No. 8003, Sept. 1944.) (TL570 Un3tm)

For the flow field of a free jet leaving a nozzle of circular cross section in a medium with straight uniform flow field, approximate formulas are presented for calculation of the velocity distribution and the dimensions of the core region. Data are graphed.

951 Experimental Aerodynamic Derivatives of a Sinusodially Oscillating Airfoil in Two-Dimensional Flow. Robert L. Halfman. National Advisory Committee for Aeronautics, Technical Note 2465, Nov. 1951, 83 pages. (TL570 Un3t)

Presents and analyzes the above. Harmonic motions include pure pitch and pure translation, for several amplitudes and superimposed on an initial angle of attack, as well as combined pitch and translation. The apparatus and testing program are described briefly and the necessary theoretical background is presented. Data are tabulated. Graphs and illustrations.

952 The Linearized Characteristics Method and Its Application to Practical Nonlinear Supersonic Problems. Antonio Ferri. National Advisory Committee for Aeronautics, Technical Note 2515, Oct. 1951, 65 pages. (TL570 Un3t)

A mathematical treatment. Data are graphed.

953 Minimum Wave Drag of Bodies of Revolution With a Cylindrical Center Section. Franklyn B. Fuller and Benjamin R. Briggs. National Advisory Committee for Aeronautics, Technical Note 2535, Oct. 1951, 34 pages. (TL570 Un3t)

The minimum wave-drag problem with auxiliary conditions is solved for axial flow about bodies of revolution consisting of two symmetrical ogival sections joined by a circular cylinder.

954 On the Spectrum of Isotropic Turbulence. H. W. Liepmann, J. Laufer, and Kate Liepmann. National Advisory Committee for Aeronautics, Technical Note 2473, Nov. 1951, 61 pages. (TL570 Un3t)

Measurements of the spectrum and correlation functions at large Reynolds number were made, as well as a series of accurate spectrum measurements at lower Reynolds number. The results are compared with the theoretical laws proposed in recent years. The second, fourth, and sixth moments of the spectrum were computed from the measurements and are discussed in relation to theoretical results. Graphs. 26 ref.

Books

955 Fundamentals of Optics. Francis A. Jenkens and Harvey E. White. 647 pages. 1950. McGraw-Hill, New York. (QC355 J41f2)

Presents an advanced treatment of the above. Emphasis is placed on the physical explanation of the various phenomena. Diagrams, illustrations, and chapter problems.

956 Some Applications of Nuclear Physics to Medicine. W. V. Mayneord. 290 pages. 1950. British Institute of Radiology, London. (*British Journal of Radiology*, Supplement no. 2.) (QC173 M45s)

Not a handbook. Founded on notes of 6 lectures (Feb. 1947) at the British Institute of Radiology, and extended to include experimental and theoretical work carried out by the authors and colleagues. Main topics are: Nuclear Physics and Isotope Production; Dosimetry of Artificial Radioactive Isotopes; Medical Use of High Energy Quanta; Measurements of Radiations From Betatrons and Synchrotrons; and Scintillation Counting and Its Medical Applications.

957 Phase Transformations in Solids. R. Smoluchowski, J. E. Mayer, and W. A. Weyl, editors. 660 pages. 1951. John Wiley & Sons, New York. (QC125 N21p)

Presents papers by various authors on the above. Papers are divided into three main groups: theoretical physics, nonmetals, and metals. Pertinent ones are separately abstracted.

958 Theory of Electrons. L. Rosenfeld. 119 pages. 1951. Interscience Publishers, New York. (QC721 R72t)

A revised and extended version of a course of lectures given by the author. Provides a framework for the electric, magnetic, optical properties of matter by discussing the foundations on which the atomistic interpretation of these properties rests. Except for a few instances, metals are not considered.

See also:
282 (statistical theory of solid-solution properties)
291 (electrical conductivity of metals at low temperatures)
308 (slip in body-centered cubic crystals)
468 (vacuum physics—symposium)
582 (British aeronautical research)
601 (rocket aerodynamics)
719 (pseudo-metallic properties of graphite and graphite-Br)
751 (radioactivity of radio elements—review)
792 (ultrasonics vs. high polymers)

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959* Automatic Tracking Radar Errors. Charles E. Brockner. *Aero Digest*, v. 63, Nov. 1951, p. 72, 74, 78, 80, 82, 84, 86.

Four sources of angular jetter in a typical conical-scanning, automatic-tracking radar are discussed and each is expressed in terms of range and system parameters.

960* Reducing the Measuring Time of Weak Current Amplifiers Without Reducing Their Sensitivity. (In French.) Joseph Taieb. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 8, 1951, p. 785-787.

Describes method and apparatus developed for the above. Includes circuit diagrams.

961* Mechanism of Ignition of the Electric Spark in Compressed Gases. (In French.) André Boulloud. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 932-934.

Discusses the above with respect to recent research in preignition currents in compressed gases.

962* A Method of Measuring the Interface Resitance and Capacitance of Oxide Cathodes. C. C. Eaglesfield and P. E. Douglas. *British Journal of Applied Physics*, v. 2, Nov. 1951, p. 318-320.

Method for the above is described. The interface impedance causes a feed-back that is frequency-dependent. Another frequency-dependent network is added in order to make the gain independent of frequency. When this is achieved, the interface components are equivalent to the measuring components. Diagrams.

963* Measuring Frequency According to the Condensed Charge Method. I. (In German.) Hans Weidemann. *Archiv für technisches Messen*, Aug. 1951, p. T87-T88. (4p.)

Principle of proposed method is based on the conversion of the incident sine wave (whose frequency is to be determined) into a rectangular sinusoidal curve with the aid of a multistage amplifier. Circuit diagrams and graphs are presented. (To be continued.)

964* Automatic Current and Voltage Regulation by Means of Glow Tubes and Iron-Hydrogen Resistances. Gerhart Kassler. *Archive für Technisches Messen*, Oct. 1951, p. T110-T112 (6 p.)

Presents formulas which make it possible to calculate whether the desired stabilization can be achieved by means of the above or whether electronic tubes have to be used. Limitations of the method are indicated. Circuit diagrams, tables, and calculations.

965* Impedance Measurements in the High-Frequency Region by Means of Bridged and Parallel T-Networks. K. Lamberts. *Archiv für Technisches Messen*, Oct. 1951, p. T108-T109 (4 p.)

Reviews the above on the basis of the literature, particularly application of the method for frequencies of 0.1-40 megacycles. Includes circuit diagrams and extensive calculations. 14 ref.

966* High-Vacuum Photoelectric Cells and Secondary Electron Amplifiers. (In German.) N. Schaetti and W. Baumgartner. *Chimia*, v. 5, Oct. 15, 1951, p. 228-236.

Surveys modern high-vacuum photoelectric cells, discusses amplification of photoelectric currents, and indicates uses in chemical research. Suitability of various alloys as cathode materials is discussed. Graphs, tables, diagrams, and photographs. 19 ref.

967 Dielectric Amplifier Fundamentals. A. M. Vincent. *Electronics*, v. 24, Dec. 1951, p. 84-88.

Tells how power amplification can be obtained through variation of the dielectric of a capacitor in an a.c. power circuit by means of a control voltage applied independently to the plates of the capacitor. Materials, circuits, capabilities, and faults are discussed.

968 Superregulated Power Supplies. A. W. Vance and C. C. Shumard. *Electronics*, v. 24, Dec. 1951, p. 109-113.

Describes, diagrams, and illustrates grid-controlled thyratron rectifiers combined with servo-stabilized d.c. amplifier in superregulator to provide 300 volts at 20 amps. with required 0.001% regulation for mathematical operations in 4,000-tube analog-digital computer. Other equally stable plate and bias supplies with high current output are also described.

969 Transistor Circuit Design. Gordon Raisbeck. *Electronics*, v. 24, Dec. 1951, p. 128-132, 134.

Tells how to derive amplifier, oscillator, modulator, and multivibrator transistor circuits from known vacuum-tube circuits. Technique, known as duality, is explained in detail and may be applied to any complex vacuum-tube circuit to find the corresponding transistor circuit. Numerous circuit diagrams.

970 High-Speed Frequency Counter. *Electronics*, v. 24, Dec. 1951, p. 156, 160, 164, 168, 172.

Describes and diagrams new device which automatically measures the frequency of an unknown with the same accuracy obtained by the use of 3 separate equipments; a frequency standard, an interpolating system, and a detector. It measures and displays directly the frequency of an unknown within the range from 0.01 cps. to 10 mc.

971 Highly Stable V-T Voltmeter. M. G. Scroggie. *Electronics*, v. 24, Dec. 1951, p. 142, 208, 212, 216, 220, 224.

Discusses limitations of presently available equipment. Describes and diagrams improved apparatus, in which output resistance can be brought far nearer the ideal zero than in conventional circuits.

972 Barium Titanate Delay Lines. Leonard M. Orman and Leslie G. Callahan. *Electronics*, v. 24, Dec. 1951, p. 224, 228, 232, 236, 240, 244, 248.

Shows that construction of a delay line from a thin sheet of barium titanate is realizable. A method is suggested for preparation of such a line.

973 Accurate Frequency Calibration Method. *Electronics*, v. 24, Dec. 1951, p. 260, 264.

Describes method developed at Naval Research Laboratory which inherently produces a signal exactly equal to the standard frequency whenever the signal to be calibrated is exactly adjusted to any detectable harmonic of the standard frequency. With the aid of this technique, less skilled personnel can perform, more quickly, equipment calibrations equivalent to those obtained through standard Lissajous methods.

974* Germanium Crystal Valves; An Assessment of Characteristics and Applications. B. R. A. Bettridge. *Electronic Engineering*, v. 23, Nov. 1951, p. 414-417.

Surveys the above. Diagrams of various systems are given.

975* Minimum Phase Networks. J. A. Tanner. *Electronic Engineering*, v. 23, Nov. 1951, p. 418-423.

Summarizes the characteristics and properties of the above with regard to their use in servo systems.

976* The Measurement of Microphony in Valves. R. Bird. *Electronic Engineering*, v. 23, Nov. 1951, p. 429-431.

Describes some of the methods now available for an investigation into the nature and causes of microphony in electronic tubes.

977* The Parallel-T Network as a Linear Mixer. J. S. Nisbet. *Electronic Engineering*, v. 23, Nov. 1951, p. 432-433.

Discusses the above. A satisfactory network for mixing should have a high transfer ratio, a high input impedance, and low-frequency sensitivity. It was found that, when very small capacitors and high resistors are used, the effect of intercapacitances becomes large and the performance of the network may differ considerably from that obtained by theoretical analysis.

978* The Prediction of Audio-Frequency Response. No. 1. Circuits With Single Reactance Element. N. H. Crowhurst. *Electronic Engineering*, v. 23, Nov. 1951, p. 440-443.

Discusses response characteristics of equipment designed for transmission of a wide band of frequencies. Describes a simple case in which only one reactance is responsible for a cut-off characteristic in either direction. Flow charts. (To be continued.)

979* Measuring Circuits Using Rectifiers. E. H. W. Banner. *Electronic Engineering*, v. 23, Nov. 1951, p. 444-446.

Describes types of rectifiers and their uses.

980 Contact Transients in Simple Electric Circuits. F. E. Martin and H. E. Stauss. *Electric Engineering*, v. 70, Dec. 1951, p. 1039. (A condensation; to be published in *AIEE Transactions*, v. 70, 1951.)

Describes an oscilloscopic investigation covering the variation of transients occurring for a fixed contact pair over a range

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of lumped inductance and lumped capacitance values in a contact circuit. In addition, effects on the transients of varying current and voltage impressed on the circuit were studied.

981 Analysis of 3-Phase Inverter With Resistive Load. R. E. Turkington. *Electrical Engineering*, v. 70, Dec. 1951, p. 1076. (A condensation; to be published in *AIEE Transactions*, v. 70, 1951.)

Discusses the above. Applications include use of inverters to supply power to induction and synchronous motors, use of inverters at the receiving end of a d.c. transmission line, and use of inverters in electric railway systems to allow power to flow from the d.c. system to the a.c. supply.

982 A Static Magnetic Exciter for Synchronous Alternators. H. F. Storm. *Electric Engineering*, v. 70, Dec. 1951, p. 1084-1088. (To be published in *AIEE Transactions*, v. 70, 1951.)

Tells how, by designing the basic exciter circuit of an alternator to make the machine as self-regulating as possible, and using the remaining deviations of output voltage to provide a correction signal to the exciter, the steady-state alternator voltage can easily be kept within ± 0.6%. Diagrams.

983* Thermal Overcurrent Relays for Motor Protection. Lynn Matthias. *Electrical Manufacturing*, v. 48, Dec. 1951, p. 114-118, 244.

Discusses temperature-sensitive units. Deals with various phases and solutions of the problem of protecting motors, controllers, and branch circuits against premature burnout.

984* What Is the Equipment Designer's Experience With Dielectrics? Lorenz E. Sieffert. *Electrical Manufacturing*, v. 48, Dec. 1951, p. 119-121, 240, 242.

A realistic approach to a practical evaluation of dielectric materials as actually used in electronic and electrical equipment. Presents test results.

985* Theory of Operation of Multiphase Nonautomatic Inverters With Condensor Commutation. (In Russian.) *Elektrichestvo*, Mar. 1951, p. 33-40.

Formulas for determination of inverter voltage under active inductive load and different circuits are presented. Equations for determination of time necessary for deionization of tubes are presented. Functional relationship for standard transformer capacitance to circuit parameters is established. Typical calculations illustrate theoretical principles.

986* Method of Calculating the Regulation of Saturation Choke Coils for Stabilization of Voltage of Rectifiers. (In Russian.) M. N. Gubanov. *Elektrichestvo*, Mar. 1951, p. 48-53.

Method for above was investigated, with particular reference to variation of electrical parameters and dimensions with operating conditions. Conditions for determination of optimum relations of choke-coil dimensions are studied. Theoretical principles are illustrated by numerical examples.

987* Influence of Alternating-Current Frequency on Electrical and Optical Parameters of Luminescent Tubes. (In Russian.) M. S. Kapnik. *Elektrichestvo*, Mar. 1951, p. 62-63.

Experimental investigation of the above showed that increasing the a.c. frequency results in an increase of light output from luminescent tubes. This phenomenon is explained briefly.

988* Recording Voltage Transients During Fuse Operation. E. B. Carne. *Engineer*, v. 192, Nov. 2, 1951, p. 553-554.

A transient recorder is described that is capable of recording the rapid voltage transients accompanying fuse operation without the use of a rotating camera and long lengths of film.

989* Electrical Engineering and Research at Queen Mary College. *Engineer*, v. 192, Nov. 2, 1951, p. 569-570.

Describes the above. Main lines of research are the study of high-voltage phenomena, dielectrics, short-circuit phenomenon, and high-voltage particle accelerators.

990* The Modern Approach to Electrical Machine Analysis. W. J. Gibbs. *Engineer*, v. 192, Oct. 12, 1951, p. 467-469; Oct. 19, 1951, p. 485-488; Oct. 26, 1951, p. 517-520; Nov. 2, 1951, p. 546-548; Nov. 9, 1951, p. 578-580.

Presents analytical theory for derivation of equations of performance for electrical machines. Equations of voltage for salient-pole, polyphase synchronous machines without damper circuits are developed and represented in matrices.

991* Some Aspects of the Thermal Short-Circuit Strength of Electrical Equipment. I. Herlitz. *Engineers' Digest*, v. 12, Nov. 1951, p. 371-373. (From *ASEA Journal*, v. 24, no. 5-6, May-June 1951, p. 84-89.)

Contains proposals for formulating guaranteed data relating to thermal short-circuit strength and indicates how the adverse effect of stray losses and beneficial effect of the heat capacity of insulation may be accounted for in simple formulas.

992 Determining Water Content in Electrical Insulation. H. B. Bolson and R. K. Drake. *General Electric Review*, v. 54, Nov. 1951, p. 34-36.

Describes method and apparatus for quantitatively determining the moisture content in the above to aid in evaluating treatments and procedures.

993 Control and Instrumentation Equipment for Large Power Circuit-Breaker Testing. A. L. Streater. *General Electric Review*, v. 54, Nov. 1951, p. 37-41.

Tells how unusual requirements imposed by high voltages at extremely high interrupting levels are met. Circuit diagrams and illustrations.

994 The Calculation of the Magnetic Field of Rectangular Conductors in a Closed Slot, and Its Application to the Reactance of Transformer Windings. E. Billig. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 4, Oct. 1951, p. 55-64.

995 Design of Electric Wave Filters With the Aid of the Electrolytic Tank. A. R. Boothroyd. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 4, Oct. 1951, p. 65-93.

Part I is devoted to the representation of image-parameter transfer functions by the electrolytic tank. In Part 2, use of the electrolytic tank as an aid to filter design on an insertion-loss basis is described. Detailed examples and experimental results are given throughout the paper. Numerous diagrams and graphs.

996 The Resistance of Round-Wire Single-Layer Inductance Coils. A. H. M. Arnold. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 4, Oct. 1951, p. 94-100.

Butterworth's two formulas for resistance of short coils with a finite number of turns and long coils of any length and having any number of turns. Numerical values of the functions appearing in the formula are given in tables.

997 Observations on the Electrical Breakdown of Gases at 2800 Mc/s. W. A. Prowse and W. Jasinski. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 4, Oct. 1951, p. 101-111.

Electrical discharges were produced in a nosed-in cavity type of resonator by energizing it from a pulsed magnetron. Individual pulses of various durations were employed. Electrons are provided in mid gap by the short ultra-violet radiation from an auxiliary d.c. spark actuated from the circuit used to trigger the power pulse. Descriptions and illustrations are given of the form of the resulting discharges, which in typical cases begins in mid gap and advances towards the electrodes, and which, in different gases at atmospheric pressure, show wide differences in appearance. 30 ref.

998* Cathode-Ray Tubes; A Review of Progress. L. F. Broadway. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 1, Nov. 1951, p. 316-320.

Presents a survey of the development of the above. 22 ref.

999* Design of Electric Wave Filters With the Aid of the Electrolytic Tank. A. R. Boothroyd. *Proceedings of the Institution of Electrical Engineers*, v. 98, pt. 3, Nov. 1951, p. 486-492. (Digest of a paper published as an Institution Monograph in Sept. 1951.)

The above is concerned wih the insertion loss approach to filter design; i.e. the design of a reactance 4-pole network which, when inserted between given resistance terminations, produces an insertion loss satisfying prescribed filtering requirements.

1000* Instrument Electronics. Mikon H. Aronson. *Instruments*, v. 24, Nov. 1951, p. 1300-1305.

Signal sources and types of signals used in instrument electronic circuits are discussed, including some common transducers. Composition of nonsinoidal waveforms and the action of simple R-C and R-L circuits are described. Differentiation, intergration ,and coupling are discussed in detail.

1001 High-Frequency Gas-Discharge Breakdown. Sanborn C. Brown. *Proceedings of the I.R.E.*, v. 39, Dec. 1951, p. 1493-1501.

Describe the similarities and differences between the above discharges and the more familiar d.c. type of breakdown, discussing the physical phenomena that occur, and showing the type of information that may be obtained from these relatively simple types of breakdown. Data are graphed.

1002 Simulation—Its Place in System Design. Harry H. Goode. *Proceedings of the I.R.E.*, v. 39, Dec. 1951, p. 1501-1506.

The above is developed in relation to other steps in the design process. From this, the relation of simulation to both the analytical attack, on the one hand, and to a final operational system, on the other, is developed. A critique of simulation is given with relation to cost, time, difficulty of execution, treatment of nonlinearities, and noisy inputs.

1003* Direction Finder and Flow Meter for Centimeter Waves. Kiyoshi Morita. *Proceedings of the I.R.E.*, v. 39, Dec. 1951, p. 1529-1534.

A new direction finder for above waves was developed which indicates wave direction by the minimum response of a dipole placed at the focus of a small paraboloidal reflector. A new flow meter was also developed which indicates directly the active power flow of the waves, in magnitude and direction. Diagrams.

1004 Modified Locked-Oscillator Frequency Dividers. Peter G. Sulzer. *Proceedings of the I.R.E.*, v. 39, Dec. 1951, p. 1535-1537.

The above is described. The circuit, which consists of an LC oscillator modified to facilitate locking, is capable of operating over a 7-to-1 plate-supply-voltage range when dividing by a factor of 30. 18 ref.

1005 Space-Charge and Ion-Trapping Effects in Tetrodes. Karl G. Hernqvist. *Proceedings of the I.R.E.*, v. 39, Dec. 1951, p. 1541-1547.

Under pressure conditions present in ordinary high-vacuum tubes, positive ions formed by collisions between electrons and residual gas molecules will be trapped in the potential trough between the screen grid and the anode. The effects of ion-trapping are discussed and a pulse method is described for measuring the conditions with and without presence of ions and for studying the ion-buildup process. Plasma-ion oscillations were observed. 10 ref.

1006 Space-Charge Effects in Reflex Klystrons. M. Chodorow and V. B. Westburg. *Proceedings of the I.R.E.*, v. 39, Dec. 1951, p. 1548-1555.

Some calculations and measurements are discussed which deal with the space-charge effects and which lead to some semi-quantitative values for the magnitude of these effects. In the calculations, the approximation of plane-parallel electrodes in the reflector region is retained, but, in comparing with experimental results, a correction is made for curvature of the reflector. Data are graphed and tabulated. 12 ref.

1007 The Transit Time Effect in a Cylindrical Diode. Way Dong Woo. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1333-1339.

The impedance offered to a small superposed alternating current by a space-change limited cylindrical diode is expressed in terms of the variational plate conductance, the transit time angle, and a group of constants which are functions of the ratio of plate to cathode radius. Data are graphed.

1008 Voltage Stabilization; Demands and Methods. A. J. Maddock. *Journal of Scientific Instruments*, v. 28, Nov. 1951, p. 325-333.

Several typical fields in which stabilization of supplies is required are discussed briefly to demonstrate the requirements to be met by the stabilizers. The principal types of stabilizers are then described, their performance noted, and their voltage and power ratings listed. The subject is confined to stabilizers suitable for use with instruments or local apparatus; main generator control is not considered. 21 ref.

1009 A Stabilized A.C. Supply for Lamps and Valve Heaters. J. C. S. Richards. *Journal of Scientific Instruments*, v. 28, Nov. 1951, p. 333-335.

A system to provide up to 150 watts of a.c. power with the r.m.s. voltage stable to ±0.1% is described. A saturated diode is used as reference element and a saturable choke as control element.

1010 An Amplidyne Shift Oscillator. John C. West. *Journal of Scientific Instruments*, v. 28, Nov. 1951, p. 336-339.

A phase-shift oscillator with a frequency range 0.06-18 c./s. is described for use in obtaining the frequency response of components of servo-systems.

1011 The Characteristics of Some Miniature High-Stability Glow-Discharge Voltage-Regulator Tubes. F. A. Benson. *Journal of Scientific Instruments*, v. 28, Nov. 1951, p. 339-341.

Presents results of a study of the above. Results of short- and long-term tests to determine striking-voltage and running-voltage variations are presented. Figures are given for temperature coefficient of running voltage and for magnitudes and durations of initial drift.

1012* The Time Lag of an Ignitron. N. Warmoltz. *Philips Research Reports*, v. 6, Oct. 1951, p. 388-400.

To ignite periodically a discharge in a rectifier with a mercury-pool cathode, a current is sent through a semiconductive rod partly immersed in the mercury. Time lag in starting the discharge was measured on an oscillograph when a charge condenser is switched by a thyratron onto the igniter. This was done for igniters of widely varying resistance in a liquid and a solid mercury cathode and in a liquid and a solid tin cathode. Also, influence of gas pressure in the tube was investigated. Results are compared with those of other investigations.

1013* New Electronic Tubes Employed as Switches in Communication Engineering. II. Switch Tubes. J. L. H. Jonker and Z. van Gelder. *Philips Technical Review*, v. 13, Oct. 1951, p. 82-89.

Continues a discussion of some experimental tubes designed for performing switching functions, in particular tubes with which switching is brought about by deflection of an electron beam. Among others, a tube was constructed which can serve in this way as a multi-way switch.

1014 Influence of Initial Velocities on Electron Transit Times in Diodes. J. T. Wallmark. *Physical Review*, ser. 2, v. 84, Nov. 1, 1951, p. 598.

A brief mathematical communication. Includes graph.

1015 Obtaining Bias Voltages in Triode Vacuum Tubes. Ralph B. Immel. *Product Engineering*, v. 22, Dec. 1951, p. 148-149.

Presents diagrams of various types of circuits and gives a description pertaining to the above.

1016 Mechanical Design Aspects of Electronic Controls. M. Goldstein. *Product Engineering*, v. 22, Nov. 1951, p. 191-195.

Surveys the above. Illustrated.

1017* Harmonic Oscillators. Norman L. Chalfin. *Radio-Electronics*, v. 23, Dec. 1951, p. 50, 52, 54, 56.

Describes the above. Discusses some overtone circuits and tells how to make adjustments required in balancing the capacitances. Diagrams.

1018* Light Sensitive Electronic Beast. Edmund C. Berkeley. *Radio-Electronics*, v. 23, Dec. 1951, p. 46-48.

Describes a small robot which has four sensing organs, and a small electronic and relay brain. A method for the design of circuits for mechanical brains and robots called Bollean algebra is described. Diagrams and tables are given.

33. *Electricity and Electronics*

1019* High Vacuum Triode Ionization Gauges. Samuel Freedman. *Radio & Television News*, v. 46, Dec. 1951, p. 35-38.

Discusses electronic methods for high-vacuum measurements. Describes a triode vacuum tube with glass tube extension and designated as ionization gages. Diagrams.

1020* A Versatile Sweep Frequency Generator. Robert M. Berler. *Radio & Television News*, v. 46, Dec. 1951, p. 43-46, 104.

Describes a laboratory-type instrument which incorporates an intensity frequency marker and electronic time base. Diagrams and illustrations.

1021* Packaged Power—Economy Size. Lloyd V. Broderson. *Radio & Television News*, v. 46, Dec. 1951, p. 63, 145.

Presents construction details on a compact selenium-rectifier voltage doubler which provides 163-330 v. at 150 ma.

1022 High-Wattage Infrared Lamps. Richard G. Sluer. *Sylvania Technologist*, v. 4, Oct. 1951, p. 74-77.

A new type of the above with a high-silica-content glass outer envelope is described. The advantages of using such a lamp as a heating unit in an electric range are discussed, and possible applications to commercial cooking needs and industrial-heating problems are considered.

1023 Water Vapor in Gas-Filled Lamps. Robert B. Reid. *Sylvania Technologist*, v. 4, Oct. 1951, p. 85.

The water-vapor cycle in tungsten incandescent lamps is briefly discussed. The enlargement of the wire at relatively cool portions of the filament, and erosion at relatively hot portions, are shown in an accompanying photomicrograph.

1024 A Photovoltaic Germanium Cell. Bernard J. Rothlein. *Sylvania Technologist*, v. 4, Oct. 1951, p. 86-88.

The electrical characteristics of developmental photovoltaic cells are discussed. Factors affecting the speed of response and sensitivity are shown to be related to the lifetime of the hole-electron pairs created.

1025* Circuit Printers for Flat and Cylindrical Surfaces. *Technical News Bulletin* (National Bureaus of Standards), v. 35, Nov. 1951, p. 168-170.

Describes the above. Steps in the operation of the printer are outlined.

1026 Recent Development in Transistors and Related Devices. John S. Saby. *Tele-Tech*, v. 10, Dec. 1951, p. 32-34, 58.

Presents a review of the semiconductor characteristics and their applications in transistors. New p-n-p junctions feature small size, high gain, low noise, high efficiency and improved stability.

1027* Lithium-Antimony Photoelectric Cathodes. (In French.) N. Schaetti and W. Baumgartner. *Vide*, v. 6, July-Sept. 1951, p. 1041-1045.

Discusses the above with respect to their weaker thermal emission which seems to make them more adaptable to studies in the violet and ultraviolet regions of the spectrum than are Cs-Sb cathodes. Includes tables and diagrams.

1028* Production of Rarefied Atmospheres of Given Characteristics. (In French.) Paul Romann. *Vide*, v. 6, July-Sept. 1951, p. 1064-1067.

Describes and diagrams glass apparatus for the above, designed for use in research on effects of traces of different gases in vacuum tubes.

1029* Transient Response; Conditions for Monotonic Characteristics. I. F. Macdiarmid. *Wireless Engineer*, v. 28, Nov. 1951, p. 330-334.

Necessary conditions for a monotonic transient response when a network is stimulated by a unit step of current are considered, and it is shown that the location of the zeros of the impedance function on the complex-frequency plane is as important as the location of the poles. Conditions for monotonic transient response are derived for networks having two poles and two zeros in the complex-frequency plane, and an example is given of a compensated anode load fed by a triode tube.

1030* Linear Diode Voltmeter; Response to Randomly-Recurrent Impulses. R. E. Burgess. *Wireless Engineer*, v. 28, Nov. 1951, p. 342-344.

Response of an ideal linear diode voltmeter to above impulses is evaluated in terms of parameters of the impulses and time constants of the voltmeter. Rectification efficiency is shown to be slightly greater than that for regularly-recurrent impulses of the same average recurrence frequency.

1931* Valve Cathode Life. C. C. Eaglesfield. *Wireless World*, v. 57, Dec. 1951, p. 505-506.

Presents an explanation for apparent deterioration of the above. A remedy in circuit design is proposed.

1032* Electrolytic Capacitors. G. W. A. Dummer. *Wireless World*, v. 57, Dec. 1951, p. 510-512.

Discusses the principles of operation of the above. Some recent developments are described. Data are graphed.

1033* Theory and Computation of the Electrostatic Amplification Factor of Plane and Cylindrical Triple-Pole Tubes for the Case of Two-Dimensional Potential Conditions. Part I. (In German.) Max Landsberg. *Zeitschrift für angewandte Mathematik und Physik*, v. 2, Sept. 15, 1951, p. 375-393.

Includes schematic diagrams. 11 ref.

Miscellaneous Publications

1034 Recent Developments in the Ramberg Vacuum Tube Accelerometer. Samuel Levy. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 151-158. (TG265 So13p)

Describes the most recent design of the above, and some of the results obtained with it.

Books

1035 Winding Alternating-Current Machines. Michael Liwschitz-Garik and Celso Gentilini. 766 pages. 1950. D. Van Nostrand Co., New York, New York. (TK2477 L76w)

Describes new developments in integral-slot, fractional-slot balanced and unbalanced lap and wave windings. Written for the winder and repairman; also useful to the design engineer. Numerous drawings, tables, and photographs.

1036 Pulse Techniques. Sidney Moskowitz and Joseph Racker. 300 pages. 1951. Prentice-Hall, Inc., New York. (TK7835 M85p)

An elaboration of a series of articles prepared for Radio-Electronic Engineering Section of *Radio & Television News*. Basis of the text is to enable individuals with electrical engineering background to analyze and design circuits for utilization of pulses.

1037 Time Bases (Scanning Generators); Their Design and Development, With Notes on the Cathode-Ray Tube. Ed. 2. O. S. Puckle. 387 pages. 1951. John Wiley & Sons, New York. (Tk381 P96t2)

Provides an introduction to the principles of the above, rather than a compendium of inventions. A statement of the historical aspects is included. Numerous diagrams, tables, and illustrations.

See also:

161 (manufacture of radar cathode-ray tubes)
365 (curing of storage-battery plates)
442 (thyratron phase-shift network)
503 (electric-spark generation of very high temperatures)
569 (ignition delay in oil burners)
574 (impedance of electric furnace busbars for calculators)

34. GRAPHIC ARTS

1038* Progress in Plastic Plates. *Bookbinding and Book Production*, Oct. 1951, p. 41-42, 66-67; Nov. 1951, p. 50-51, 70.

Surveys the above. The performance of plastic as compared to electrodeposited printing plates is discussed.

1039 Screen Process vs. Conventional Forms of Printing. Part I and II. Harry L. Hiett. *Graphic Arts Monthly and the Printing Industry*, v. 23, Oct. 1951, p. 30-34, 37; Nov. 1951, p. 26, 28, 30, 164.

Discusses relative merits of the above. Gives a brief description of the industry today.

1040 Modern Trends in Lithography. *Graphic Arts Monthly and the Printing Industry*, v. 23, Nov. 1951, p. 65, 68, 70, 72, 74, 76, 78.

Surveys the above. Describes the use of Monel metal and stainless steel for lithographic plates.

1041 Ferrography. Ralph B. Atkinson and Steven G. Ellis. *Journal of the Franklin Institute*, v. 252, Nov. 1951, p. 373-381.

The process described enables graphic information to be recorded on magnetic materials and to be reproduced on paper in visual form. Magnetic inks are available in black or in colors, enabling monochrome or color reproductions to be made. The magnetic matrix may be used repeatedly so that multiple printing is possible, and the matrix may be stored indefinitely.

1042* Kodak Research in the Graphic Arts. Walter Clark. *Photoengravers Bulletin*, v. 41, Nov. 1951, p. 51-57.

Surveys some of the graphic arts research problems of the Kodak Research Laboratories in Rochester, N. Y.

1043* Automatic Electro Consolidator-Leveler. Homer L. Bishop. *Printing Equipment Engineer*, v. 82, Nov. 1951, p. 17-19.

Gives an account of the development and initial use of above equipment, which was developed with two primary objectives: to consolidate evenly the entire backing metal of an electrotype printing plate; and, at the same time, level the face of the plate to such an extent that little if any hand finishing is necessary.

See also:
1025 (circuit printers for flat and cylindrical surfaces)

35. STATISTICS AND ECONOMICS

1044 The Booming West Coast Aircraft Industry. R. Raymond Kay. *Automotive Industries*, v. 105, Nov. 15, 1951, p. 42-47, 102, 104, 106, 108.

Illustrated description includes extensive tabular economic data.

1045 Lead Supply Fading Away. *Business Week*, Nov. 17, 1951, p. 124, 126, 129.

Discusses lead supply problem and the various factors affecting it.

1046 Iron Ore; World Demand and Resources. T. P. Colclough. *Iron and Steel*, v. 24, Nov. 1951, p. 507-508. (A condensation)

Surveys the above. Production data are tabulated.

1047 Coke and By-Products in 1950. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 92-97.

Presents salient statistics on the above.

1048 World Metal Shortages and Resources. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 515-519; disc., p. 519.

Presents a summary of several papers presented on the above sponsored by the Institute of Metals on Oct. 17 in London. Topics covered included nonferrous metals, substitute alloys, secondary light metals and secondary heavy metals.

1049 Industrial Minerals of North Carolina. Jasper L. Stuckey. *Mining Engineering*, v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 190, 1951, p. 1093-1096.

Describes geological investigation and research which have contributed greatly in making industrial minerals the basis of an important industry in the state. North Carolina contains a wide variety of industrial minerals and rock. Mica, feldspar, kaolin, halloysite, talc, pyrophyllite, sillimanite, and spodumene are used to illustrate the progress being made. 16 ref.

1050* Economic Aspects of Petroleum Refining in Benelux. (In French.) Emeric Kroch. *Revue Universelle des Mines, de la Métallurgie des Travaux publics, des Sciences et det Arts appliques a l'Industrie*, ser. 9, v. 94, Oct. 1951, p. 305-317.

Discusses problems pertaining to recent construction of numerous petroleum refineries and the production of crude oil in Benelux, particularly Belgium, within the framework of the E.C.A.

1051 Europe in the Petroleum Economy of the Free World. (In Italian.) W. J. Levy. *Rivista dei Combustibili*, v. 5, Sept. 1951, p. 439-451.

The European oil industry is outlined, with particular reference to the present postwar expansion of consumption, and to the situation imposed by the rearmament program. The serious commercial and financial problems connected with the oil industry and the present relations between Europe and the Middle East are analyzed.

Books

1052 Die Eisenerzvorräte der Welt und der Anteil der Verbraucher- und Lieferländer an deren Verwertung. (The Iron-Ore Resources of the World; Their Utilization and Distribution Among the Consuming and Producing Countries.) Gustav Einecke. 418 pages and 100 maps, respectively. 1950. Verlag Stahleisen, M.B.H., Dusseldorf, Germany. (TN400 E62e)

Discusses and presents tabulated data, in Vol. I on the world's iron resources by countries, while Vol. II is an atlas of maps which shows the location of iron-ore deposits in various countries, including those in the Soviet sphere of influence. Numerous references.

1053* World Railways 1950-51. Ed. 1. Henry Sampson. 600 pages. 1951. Rand McNally, New York. (TF1 W89)

A reference book containing, in a readily accessible form, information on methods of operation and type of equipment in use on rail systems throughout the world. 102 maps, 696 photographs, and 420 diagrams.

1054 Agricultural Marketing. Ed. 1. Frederick Lundy Thomsen. 482 pages. 1951. McGraw-Hill, New York. (HD9005 T38a)

A beginning text covering the marketing job, system, prices and margins, auxiliary services, potential improvements and means of effecting same.

See also:
570 (electric vs. gas furnaces—cost factors)
1074 (mineral resources of the world—book)

36. MISCELLANEOUS

1055* Preliminary Observations on Toxicity of Elemental Selenium. Robert H. Hall, Sidney Laskin, Paul Frank, Elliott A. Maynard, and Harold C. Hodge. *A.M.A. Archives of Industrial Hygiene and Occupational Medicine*, v. 4, Nov. 1951, p. 458-464.

17 references.

1056 Aluminum Alloy Characteristics. *American Foundryman*, v. 20, Nov. 1951, p. 56-59.

Presents tabular data compiled by Alloy Recommendation Committee, Aluminum and Magnesium Div., American Foundrymen's Society. Compositions, foundry, and other properties of sand-cast, permanent-mold-cast, and die-cast Al alloys are presented.

1057* Properties and Applications of Super-Purity Aluminum. (In Italian.) G. Missier. *Alluminio*, v. 20, Sept. 1951, p. 329-340.

Discusses production methods, properties, and applications of the above. Tables, photomicrographs, graphs, and diagrams. 47 ref.

1058* The Influence of Permeability on Ore Distribution in Limestone and Dolomite. Part I. Ernest L. Ohle. *Economic Geology and the Bulletin of the Society of Economic Geologists*, v. 46, Nov. 1951, p. 667-706.

General knowledge of rock permeability is reviewed in the light of fundamental work done since Rove's pioneer study, and an attempt is made to evaluate the influence of permeability on ore distribution in limestone and dolomite. Over 1000 permeability determinations were made, principally on rocks from the East Tennessee zinc district. A permeameter is described which was especially designed to measure permeabilities in the range 10^{-2} to 10^{-7} millidarcies, using either liquid or gas as the test fluid.

36. *Miscellaneous*

1059* Competitive and Co-Operative Research in the American Petroleum Industry. Robert E. Wilson. *Journal of the Institute of Petroleum*, v. 37, Aug. 1951, p. 407-425.

Third Cadman Memorial Lecture. Includes diagrams and illustrations.

1060 Toxic Metals Cause New Industrial Disease Problems. W. Schweisheimer. *Iron Age*, v. 168, Dec. 6, 1951, p. 159-161.

Surveys the above, giving examples of the kinds of disease problems caused by specific metals. 18 ref.

1061 Conservation of Materials. J. R. Widdowson. *Iron and Steel*, v. 24, Nov. 1951, p. 497-499.

Considers the scarcity of alloy steel, stainless steel and tool-steel as well as H_2SO_4 for pickling, and of fuels. Suggestions on conservation practices are offered.

1062* Research and Development: The Nation's Balance Sheet in June 1951. Eric A. Walker. *Journal of Engineering Education*, v. 42, Nov. 1951, p. 126-133.

Discusses problems of money and manpower, the military research problem, evaluation methods in military research, and administrative problems of government.

1063 Utilization of Research in Production of Oil. John E. Sherborne. *Journal of Petroleum Technology*, v. 3, Nov. 1951, sec. 1, p. 15-17; sec. 2, p. 7.

A general discussion.

1064 Zinc—Its Sources, Uses and Supply. Charles A. Scarlott. *Materials & Methods*, v. 34, Nov. 1951, p. 59-63.

An illustrated survey.

1065 Conservation of Strategic Metals in Germany. Karl P. Harten. *Metal Progress*, v. 60, Nov. 1951, p. 58-63.

Surveys the above. Discussion is limited to Co, Cu, Cr, Mn, Mo, Ni, Cb, and W. Data are graphed.

1066 A Sampling From World Metallurgical Congress Visitations. *Metal Progress*, v. 60, Nov. 1951, p. 77-87.

Presents a summary of reports of the above. Topics covered are: Inspections and Control in Process, Manufacture of Special Bronze, Welding of Auto Bodies and Soldering of Radiators, Pyrometers, Furnaces and Controls, Wrought and Cast Magnesium, Machinability in Relation to Chips, and Lubricants and Thin-Walled Bearings.

1067 Lithium Minerals Provide Unique Industrial Raw Material. P. E. Landolt. *Mining Engineering*, v. 3, Dec. 1951, p. 1045-1048.

Presents a brief discussion on the above. Applications of Li and Li compounds in various industries are given.

1068* Exploration and Development of Canadian Uranium Deposits. B. S. W. Buffam, and E. B. Gillanders. *Mining Journal*, v. 237, Nov. 16, 1951, p. 492-495.

Surveys the above, giving an account of detailed Geiger surveys, diamond drilling, underground development, sampling and metallurgical tests, and operating costs.

1069* New Light on Jet-Bit Drilling. W. S. Sease. *Oil and Gas Journal*, v. 50, Nov. 15, 1951, p. 136, 139, 173, 175-176.

Presents the engineering problems involved in jet-bit usage. Considers correct mud volume, not pressure, as a basic requirement.

1070* The Basic Metal. Paul Cohen. *Technology Review*, v. 54, Nov. 1951, p. 25-28, 42, 44.

Reviews trends in the steel industry. Discusses the outlook for future output. Some production data are given.

1071* Titanium and Titanium Alloys. (In German.) Hans Otto Nicolaus. *Werkstoffe und Korrosion*, v. 2, Sept. 1951, p. 321-334; Nov. 1951, p. 416-424.

Part I describes basic raw materials, methods of production from the ore, physical and mechanical properties, preparation of alloys, effect of non-metallic elements, etc. Part II first discusses the importance of Ti as an alloying element in iron metallurgy and especially in the manufacture of alloy steels. Effects of different high additions of Ti to the common non-ferrous heavy metals and to Al are described. Finally, some American experiences in machining and forming of Ti are described. Numerous graphs, tables, and photomicrographs. 65 ref.

1072* Titanium in Western Aircraft Production; Advantages and Limitations. A. H. Petersen and N. J. Wells. **Titanium Takes the Test at Ryan Aeronautical.** William S. Cockrell. *Western Metals*, v. 9, Nov. 1951, p. 35-39.

Reports by two leading western aircraft manufacturers present available information on titanium's properties, advantages, specialized techniques for working, and practical applications in airframe production.

Miscellaneous Publications

1073 Nickel and Its Alloys. National Bureau of Standards, Report 485, Mar. 22, 1950, 72 pages. (T21 Un3c)

Reviews all available information about Ni and its alloys, with particular attention to the physical properties and applications of the metal, and its ferrous and non-ferrous applications. (A revision of National Bureau of Standards, Circular 100, issued in 1924.) 402 ref.

Books

1074 The Formation of Mineral Deposits. Alan M. Bateman. 371 pages. 1951. John Wiley & Sons, New York. (TN263 B31f)

Covers materials involved, theories concerning origin of deposits, relation to igneous activity, primary mineralizing solutions, formation processes, exploration and exploitation of deposits, distribution and conservation of resources, and future outlook.

1075 Punched Cards; Their Applications to Science and Industry. Robert S. Casey and James W. Perry, editors. 506 pages. 1951. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. (HF5371 C26p)

Consists of introduction by the editors; 3 articles on punched-card applications; 10 articles on miscellaneous considerations, including mathematical calculations involved in design of punched-card systems; an article on the possibility of applying mechanized methods to scientific and technical literature; and a bibliography of 276 references. Primary purpose is to meet the needs of the individual scientist or engineer. Hand-sorted edge-punched cards are discussed in greater detail than machine-sorted cards.

1076 The Soviet Financial System: Its Development and Relations With the Western World. Mikhail V. Condoide. 230 pages. 1951. Bureau of Business Research, College of Commerce and Administration, Ohio State University, Columbus, Ohio. (HJ192.R9 C75s)

Analyzes the operations and significance of the Soviet financial system, and its place and role in the collectivistic economy of the Soviet Union.

1077 Terrestrial Magnetism and Electricity. J. A. Fleming, editor. 794 pages. 1949. Dover Publications, New York. (QE500.P5 F62t)

Chapters by various authors cover different aspects of the complex nature of the earth's magnetic and electric fields.

1078 Towards an Understanding of the U.S.S.R.; A Study in Government, Politics, and Economic Planning. Ed. 2. Michael T. Florinsky. 223 pages. 1951. MacMillan Co., New York. (HC331 F66t2)

Appraises evolution of the above of the Soviet State from 1917 to 1950. Describes formal structure of the Soviet Government, but is mainly devoted to actual practice—policies in running planned economy and in managing industry, agriculture, and labor. This edition incorporates new material, but major conclusions are not altered.

1079 Internal Constitution of the Earth. Ed. 2. Beno Gutenberg, editor. 439 pages. 1951. Dover Publications, Inc., New York. (QE500.P5 G98i2)

Consists of introduction and summary by the editor, plus 14 articles by authorities on various aspects of the subject.

1080 Economic Development in Latin America. Simon G. Hanson. 531 pages. 1951. Inter-American Affairs Press, Washington. (HC165 H19e)

Presents a comprehensive survey on the above.

1081 Managing Your Mind. S. H. Kraines and E. S. Thetford. 374 pages. 1951. MacMillan Co., New York. (BF67 K85m)

The theme lies in understanding one's self as both a physical organism dominated by needs and desires, and as part of a social whole whose welfare is, in part, the responsibility of everyone. Demonstrates the validity of the premise that emotional states determine the well-being of the body as they reflect it, and gives a detailed explanation of the technique whereby the situation can be controlled.

1082* Guide to Geologic Literature. Ed. 1. Richard M. Pearl. 239 pages. 1951. McGraw-Hill, New York. (Z6031 P31g)

Effort was made to cover, by means of appropriate references to lists, indexes, and bibliographies, all published literature on geology from the earliest dates, as well as current material of vital significance to present discoveries and developments. The book is designed to serve both the history-minded student and the practicing geologist.

1083 Industrial Medicine on the Plutonium Project. Robert S. Stone, editor. 511 pages. 1951. McGraw-Hill, New York. (RA1231.R26 S72)

Presents a technical account of information collected while developing methods for producing plutonium. Some of the information deals directly with nuclear physics and chemistry. Most of it is related rather to technical processes that needed to be performed in preparation for making the plutonium. One of a series prepared as a record of research done under Manhattan Project for AEC. Introduction by the editor is followed by 10 chapters by various authors which survey various general aspects. Second part of book consists of 10 papers which deal with more specific topics.

1084 The Growth of Scientific Ideas. William P. D. Wightman. 495 pages. 1951. Yale University Press, New Haven, Conn. (Q125 W63g)

Presents a study of the development of scientific thought as illustrated by a few dominant ideas. Attempts to integrate the various fields of science.

1085 Annual Report of Council. 131 pages. 1950. British Iron & Steel Research Assn., 11 Park Lane, London 1, England. (HD9510.4 B77a)

Includes summary of work of the various divisions in metallurgy and metalworking.

1086 Drilling and Production Practice, 1950. 344 pages. 1951. American Petroleum Institute, New York. (TN862 Am35d)

Presents 25 papers by various authors on the above pertaining to the oil and natural gas industry.

1087 Tables of the Exponential Function e^x. 537 pages. 1951. National Bureau of Standards, Washington (Applied Mathematics Series 14.) QA342 Un3t)

See also:

39 (miscellaneous properties of Hf)
514 (metallurgy in the U.S.S.R.)
540 (industrial wastes utilization—book)
664 (Russian small arms)

Notes From Battelle

STRONG ARM FOR DEFENSE

U. S. research is in excellent position to solve any technical problems that might arise in a national crisis. Our research position is the strongest in the world and much stronger than at the end of World War II.

Estimates made by Battelle show that industry and government spent about two billion dollars on research in 1951. In 1940, only about 345 million dollars were spent. Thus, we are now spending nearly six times as much on research as we did ten years ago. Although dollar depreciation tends to depress this comparative figure when it is translated into productivity, there is reason to believe that increased research efficiency partially offsets the inflationary factor. In all probability, U. S. research is four to five times as strong as immediately before World War II.

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X-RAYS AND BACTERIA

In recent years, there has been much interest in the effects of radiation on micro-organisms. Aside from the medical connotations, there is good reason to believe that this research may lead to significant developments in commerce and industry. For instance, X-rays kill bacteria—which suggests the use of X-rays to preserve foods.

During a study of possible industrial applications of the effects of X-rays on bacteria, Battelle prepared a comprehensive bibliography on the subject. The bibliography covers the literature from 1896 to August, 1951, and gives 178 references. To those interested in the effects of radiation, in general, and to those interested in some specific problem concerning the effects of X-rays on bacteria, the bibliography will serve as a guide to the work done on the subject. Copies of it may be obtained by writing to Battelle.

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HARVESTING IRISH PEAT

To help the government of Ireland become independent of importations of fuel, Battelle is conducting for the Irish Turf Board a research investigation on the winning and utilization of peat. Ireland has about three million acres of peat bogs, capable of supplying all of the country's energy requirements for some 300 years. Yet, because of hand methods of harvesting and inefficient utilization, Ireland is forced to import coal.

Irish peat can be dug only during the months from March through July, the dry season in Ireland. Since much of the labor is by hand, only about half of the peat needed can be harvested during this brief period. With the help of Battelle, the Irish Turf Board hopes to develop mechanical methods of harvesting and processing peat, and thus enable Ireland to become self-sufficient in respect to fuels.

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ELECTRONIC PHYSICS DIVISION FORMED

To centralize its research in electronic physics, Battelle has established a new research division. The new division will be concerned primarily with basic studies in thermionic emissions and in the improvement of electronic tubes and other electronic mechanisms.

Dr. Francis C. Todd, a member of the Battelle staff since 1942, has been named supervisor of the electronic physics division. He is known for his work on cathodes for magnetrons, voltage regulator tubes, electronic power controls, and electronic control and inspection mechanisms. He holds degrees from Oklahoma Agricultural and Mechanical College, the Carnegie Institute of Technology, and the University of Chicago.

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ULTRA HIGH-SPEED CAMERA

One-hundred thousand pictures per second can be taken with a new ultra high-speed motion picture camera designed by C. D. Miller and Arthur Scharf of the Battelle staff. The camera is a modification of a design developed by Mr. Miller earlier when associated with the laboratories of the National Advisory Committee for Aeronautics. It is ten times as fast as most high-speed cameras now on the market.

Built as a research tool, the camera will be used in the study of industrial problems involving high-speed phenomena. It makes possible the progressive photography of explosions and high-speed rotary and lineal motions. It offers a method of attack to such problems as the knock in a heat engine, the chattering of cutting tools, or the irregular operation of a filament spinneret.

The camera resolves 30 to 40 lines per millimeter

lens opening can be made as large as f/2. A single photographic series of 500 frames can be projected as a motion picture immediately after development. A versatile unit, the camera can be used to photograph luminous or nonluminous objects, for direct photography, shadowgraphs, or schlieren photography.

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BORON IN STEEL

The non-metallic element boron can be used in place of the scarce alloying metals, manganese, nickel, chromium, and molybdenum, to improve the hardenability of steels, research has shown. With proper metallurgical practice, boron can do the job of increasing hardenability without adversely affecting physical properties or safe performance. This makes possible, in the interest of national security, the conservation of conventional alloying materials for the most critical purposes.

Although boron steels were used late in World War II, steel users since the end of the war, with few exceptions, have not favored them. Boron steels are more sensitive to steelmaking practice than most other alloy steels, which probably accounts for the poor reputation they have acquired in some quarters. They are, however, less sensitive to "shatter cracks" and "flakes" than some of the steels they replace.

It has been estimated that some 20 million tons of boron-treated steels will be produced in 1952. This is ten times the output in 1951.

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THE STRENGTH OF GLASS

Despite the vast strides made in the manufacture and use of glass, this material is still a mystery material to science. For one thing, we do not know how to take advantage of its intrinsic strength. As Benjamin Melnitsky points out in a recent issue of the "Midwest Purchasing Agent," the atomic forces binding glass together are known to be more tenacious than those for the toughest ferrous alloys. Theoretically, glass should have a strength as high as 3,000,000 psi. Yet, the maximum working stress for ordinary annealed glass is in the range of 1,000 psi. The toughest heat-treated varieties go no higher than 4,000 psi. Whether research will enable man to realize the theoretical strength of glass in other than specialized forms is problematical, but even achievement of a few per cent of the theoretical value would give us a superb engineering material of almost inexhaustible supply.

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The ability of the human mind to solve a problem through the use of combined brain power is the very foundation of our many successes.—*William H. Dow*, President, Dow Chemical Co.

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Happiness
And Science dawn though late upon the earth;
Peace cheers the mind, health renovates the frame;
Disease and pleasure cease to mingle here,
Reason and passion cease to combat there,
Whilst mind unfettered o'er the earth extends
Its all-subduing energies, and wields
The sceptre of a vast dominion there.

—*P. B. Shelley*